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Geology of the

Bourkes Area
District of Timiskaming

By

H. L. LOVELL

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Scale, 1 inch to ½ mile.

ABSTRACT

This report describes a block of townships that were extensively prospected only for gold, especially during periods of peak exploration activity in the Kirkland Lake-Larder Lake area. The area comprises Tolstoi, Black, Benoit, Terry, Lee, and Maisonville Townships for a total of 216 square miles.

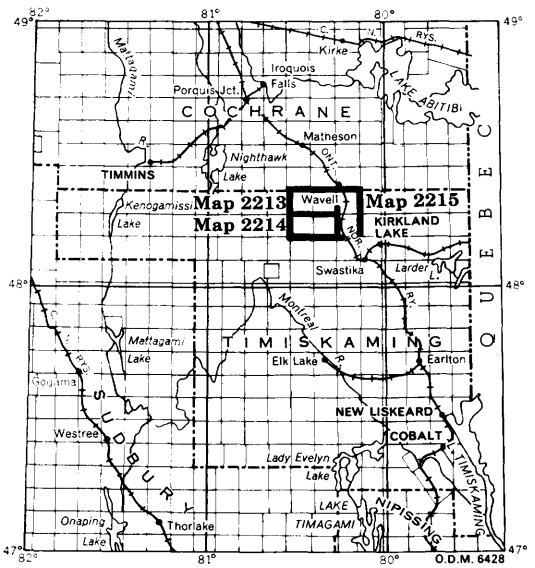

Figure 1—Key map showing location of the Bourkes area, Tolstoi, Black, Terry, Lee, Benoit, and Maisonville Townships. Scale, 1 inch to 50 miles.

The map-area lies between the Larder Lake and Destor-Porcupine Faults, in the broad "Abitibi" belt of volcanic rocks extending from Timmins, Ontario, to Chibougamau, Quebec. The Bourkes area lies along several miles of the axis of the main central syncline in the predominantly volcanic Archean rocks between the mining areas of Timmins-Matheson, Kirkland Lake-Larder Lake, and Noranda. In addition, the southeastern part of the Bourkes area contains the broad western limb of a north-plunging fold. All bedrock is of Precambrian age, with representatives of every major division of the stratigraphic column in the northern part of northeastern Ontario. It is of interest to note that considerably more serpentinite, gabbro, and diorite were found during the mapping than is shown by previously published reconnaissance maps. The area with the highest percentage of these rocks is Maisonville Township, where several gabbroic stocks occur.

Base metals, gold, and silver are present in economically interesting concentrations and a few serpentinite outcrops contain asbestos. The greatest economic potential seems to be for base metals, especially zinc, lead, and copper in and near graphitic layers interbedded with mafic and felsic metavolcanics. Examples of such mineralization occur in Maisonville Township around Wolf Lake, and in Black Township west of Butler Lake. Nickel is present in gabbro, diorite, and nearby metavolcanics, as well as in concentrations of pyrite and pyrrhotite. Examples of these types of mineralization are in the gabbro stock in the northeastern part of Black Township, and in the central part of Maisonville Township.

An important feature of the Bourkes area, as well as parts of the above-mentioned mining areas, is that zinc, lead, and copper are present in association with the sheared graphitic sedimentary rocks containing pyrite and pyrrhotite near the contacts of mafic and felsic metavolcanics. One difficulty in exploring the mineralized zones in the Bourkes area, as in many base metal

zones of the Kirkland Lake area, is that the proportion of sphalerite to galena and particularly to chalcopyrite is high. Furthermore, the highest concentrations of zinc, lead, and copper are not with the highest concentrations of pyrite, pyrrhotite, or graphite. Consequently the highest magnetic and electromagnetic anomalies, on which so much diamond drilling has been based, generally do not provide the best drill targets.

In order to devise more refined methods of interpreting geophysical observations than simply drilling widely spaced holes on the sharpest crossovers, geological reasoning is required. For example, field mapping in the Halliday-Midlothian area west of Kirkland Lake has indicated that area's greatest concentrations of copper to be in rocks within a few hundred feet stratigraphically above the large barren sulphide zones in which most of the drilling has been done. Similarly, prospecting has revealed the largest high-grade concentrations of base metals south of Kirkland Lake to be near, but *not in*, the bedrock causing the highest magnetic and electromagnetic anomalies. Apparently the highest grade concentrations of zinc, lead, and copper in the Kirkland Lake area (including the Bourkes area) are along strike or *en echelon* from or short distances stratigraphically above (but *not in*) the zones of bedrock causing the highest magnetic (magnetite, pyrrhotite) and electromagnetic (graphite, pyrite, pyrrhotite, marcasite) anomalies.

Geology

of the

Bourkes Area

District of Timiskaming

by

H. L. Lovell*

INTRODUCTION

The Bourkes area consists of six townships; Tolstoi, Black, Benoit, Terry, Lee, and Maisonville, each of which is 6 miles square. The first three townships (Photo 1) were mapped by a field party led by the writer in 1965, and the remainder (Photo 2) in 1966. The hamlet of Bourkes is in Benoit Township; Sesekinika village is near the southern boundary of Maisonville Township; and the southeastern corner of the Bourkes area adjoins the northwestern corner of Teck, the township in which Kirkland Lake and Swastika are situated. The northern boundary of the map-area is 8 miles south of the Ross Mine (Hollinger Consolidated Gold Mines Limited) at Holtyre.

Highway 11, the main line of the Ontario Northland Railway, the Trans Canada natural gas pipeline, and a high voltage electric power transmission line traverse Maisonville and Benoit Townships. Highway 570 extends from Highway 11 southeastward to the village of Sesekinika, a flag station on the railway. Networks of logging roads provide good access to most land areas and lakes. Black and Lee Townships are reached via roads extending westward from Highway 11. The main road to Tolstoi Township branches from Highway 11 near Matheson, which is about 15 miles northwest of the map-area. Terry Township can be reached from Kenogami Lake, on Highway 11 south of the map-area, via Highway 66 and the Englehart River Forest Management Road. The Black River (in Benoit Township) is navigable by boat, and the White Clay River system (Woollings Creek) is navigable from ½ mile west of Meyers Lake in Lee Township to Bourkes in Benoit Township.

The Bourkes area was first prospected for gold during the early days of the Kirkland Lake gold rush. In 1914, Gilbert Labine discovered gold and tellurides in Maisonville Township, concession II, lot 9, but the height of prospecting activity was in the 1930s, when several pits and shafts were sunk. Small amounts of gold were produced from the Bourkes, Lee Gold, Lakeland, and Golden Summit Mines. For base metals, little exploration has been carried out.

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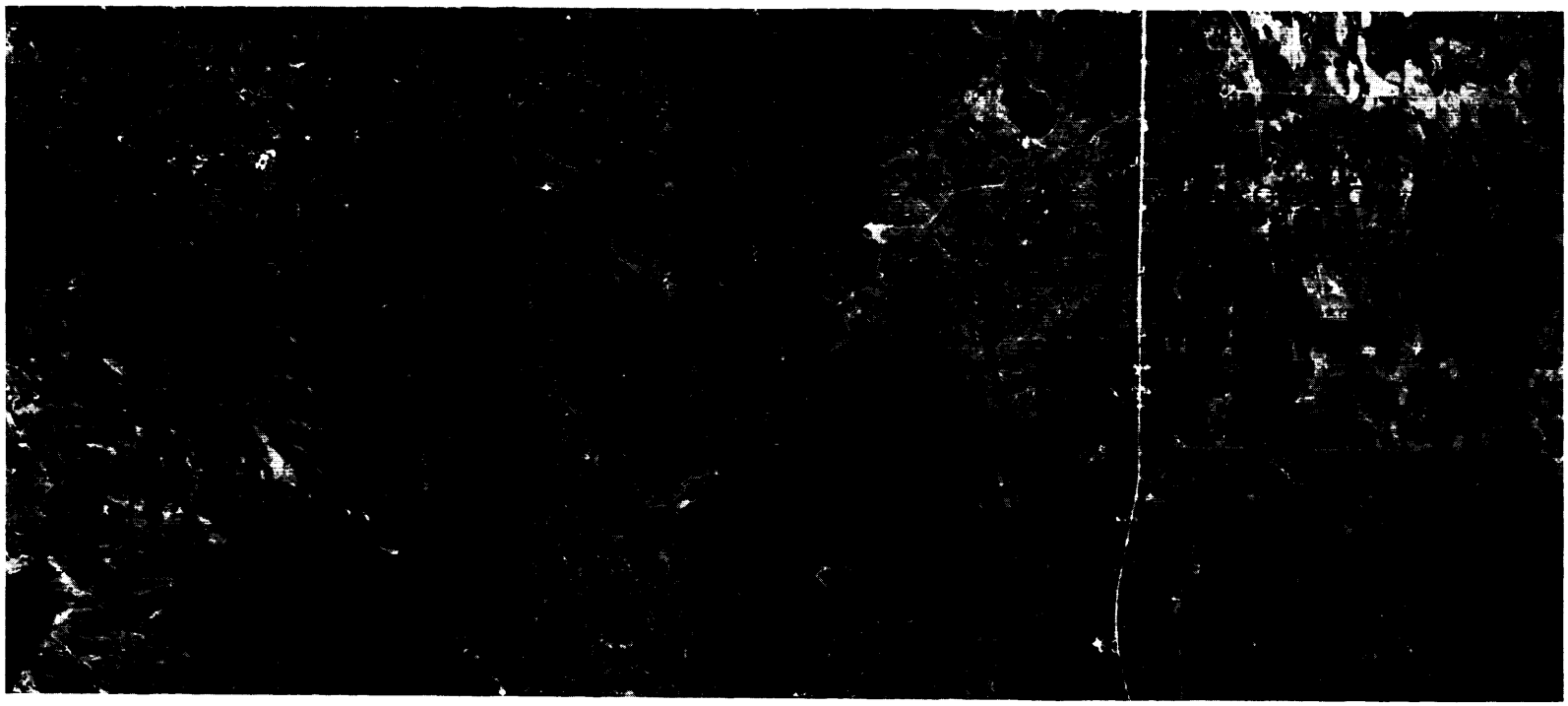

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Photo 1—Airphoto mosaic of Tolstoi, Black, and Benoit Townships illustrating (west to east) sand dunes, glacial fluting, the Tolstoi Creek lineament, the Butler Lake esker, and the subdivided Great Clay Belt farmland of Benoit Township east of Highway 11.

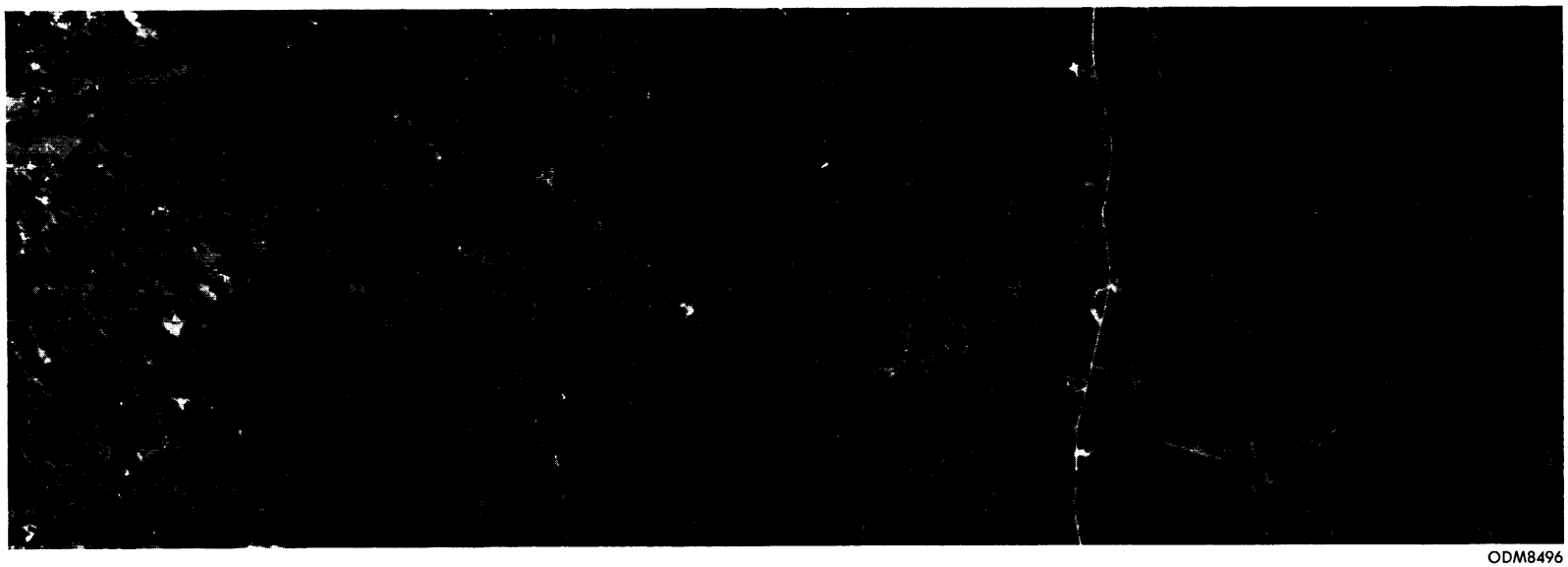

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Photo 2—Airphoto mosaic of Terry, Lee, and Maisonville Townships illustrating (west to east) sand dunes east of Watabeag Lake, and east of Highway 11 the well-exposed bedrock terrain in the vicinity of the height of land.

FIELD WORK

Basemaps of the six townships were prepared by the Cartography Section of the Ontario Department of Mines from Forest Resources Inventory sheets of the Ontario Department of Lands and Forests. These were provided on the scale 1 inch equals ¼ mile. Air photographs from the Silviculture Section, Ontario Department of Lands and Forests on the same scale were used in the field. Roads, trails, the shorelines of most lakes, and outcrops indicated by studies of air photographs were mapped geologically. Many outcrops in Black and Lee Townships and the eastern part of Terry Township cannot be identified on the air photographs used during mapping because they are obscured by second-growth bush. These areas were traversed using an east-west grid system, with lines 1,000 to 1,320 feet apart. The geology was tied to recognizable features on air photographs.

Uncoloured preliminary geological maps at the scale 1 inch equals ¼ mile were published for each township by the Ontario Department of Mines. The names and numbers of the maps are as follows: Tolstoi Township, P.327; Black Township, P.328; Benoit Township, P.329; Terry Township, P.365; Lee Township, P.389; and Maisonville Township, P.409 (Lovell 1966a, b, c, and d; 1967a and b).

ACKNOWLEDGMENTS

John Ramsden was senior field assistant in 1965, when the townships of Tolstoi, Black, and Benoit were mapped. Junior assistants were L. S. Jensen, Jobst von Heymann, and, for parts of the summer, Terence Donaldson and J. F. Barlow. In 1966, when Terry, Lee, and Maisonville Townships were mapped, L. S. Jensen was senior field assistant. Junior assistants were B. W. Fallis, S. H. Watts and, for parts of the summer, J. E. Low, Pierre Robin, and Dale Nugent. Their co-operation is appreciated. Mining company reports from the files of the Resident Geologist at Kirkland Lake were used by the writer.

PREVIOUS GEOLOGICAL WORK

In 1902, L. L. Bolton of the Ontario Bureau (now Department) of Mines made notes on the geology of Sesekinika Lake and the White Clay River during his canoe trip from Round Lake to the Abitibi River (Bolton 1903). Before 1914, A. G. Burrows and P. E. Hopkins mapped Maisonville and nearby townships (Burrows and Hopkins 1914). In 1916, A. G. Burrows examined some gold-bearing veins in Benoit Township (Burrows 1917). In 1920, D. G. H. Wright mapped the Black River area, part of which includes the townships of Black, Benoit, and Maisonville, and in 1921, he mapped the Watabeag area, part of which includes the townships of Tolstoi, Terry, and Lee (Wright 1921; 1922).

TOPOGRAPHY

Topographical relief in most of the map-area is low, but elevations above sea level range from 1,024 feet at the bench mark at Sesekinika village in Maisonville Township to about 1,400 feet in the west-central part of Black Township. The highest cliff in the map-area is "Defiance Peak", a ridge of typically resistant Cobalt sedimentary rocks rising 350 feet above the surrounding Keewatin volcanic rocks. Defiance Peak is in the northeastern part of Black Township, about ½ mile west of the south end of Butler Lake.

The height of land separating the watershed of the St. Lawrence River system from that of James Bay trends approximately east through the central parts of Terry, Lee, and Maisonville Townships. In Maisonville Township on Highway 11 less than ½ mile north of its junction with Highway 570 (to Sesekinika village), a signboard marks the location of the southern boundary of the "Arctic Watershed", where the elevation of the "Hudson Bay-St. Lawrence Divide" is 1,062 feet above sea level.

NATURAL RESOURCES

The map-area has been cut over several times for lumber, firewood, and pulpwood. Logging companies are now cutting jack pine on the sandy land in Tolstoi and Terry Townships, and spruce, jack pine, poplar, and birch from several locations in Black, Benoit, and Maisonville Townships. A few white and red pines are present around Swan and Upper and Lower Twin Lakes. The best stands grow in thin soil on Cobalt sedimentary rocks.

Both Benoit and Maisonville Townships were subdivided into concessions and lots, but in Maisonville Township only a few acres east of Sesekinika village and north of Lower Twin Lake were cleared for farming. Much of the farmland has not been fertilized or tilled sufficiently. Many farms have been abandoned, and several old fields are covered by young poplar and underbrush. Some attempts are being made to accumulate farmland into larger groups to use as pasture for beef cattle.

Moose, bears, beavers, and duck were seen during the two summers of geological field work. About 1 dozen bears were killed by hunters in Benoit Township during the summer of 1965 alone. Woollings Creek and the White Clay River between Meyers Lake and Lower Twin Lake is a popular waterway for fishing, as is Sesekinika Lake, in which a 14 pound pickerel was caught during 1966.

The name of Sesekinika Lake is derived from Ojibway Indian for "islands clustered together" (Bolton 1903). Many summer cottages are on the islands and mainland shore of the lake. Watabeag Lake, the eastern shore of which is in Terry Township, owes its name to the "reflection of the stars in the water", according to Mr. McDougall, an Ojibway resident of Matheson, Ontario. Watabeag Lake is partly spring-fed and the water is clear. Many miles of its shore consist of beautiful sand beaches derived from re-working of eskers and sand dunes. In the past few years some cottages have been built along the lakeshore west of the map-area. Butler and Malloch are narrow lakes along the south-trending esker in the eastern part of Black Township. They, too, have clear water, and a number of cottages have been built along their sandy shores.

INHABITANTS

About 200 people live in Benoit and Maisonville Townships, most of them near Wavell, Bourkes, and Sesekinika. Sesekinika is the largest community, having about 60 people. The northern part of Benoit Township (south of Wavell post office in Cook Township) was settled principally by people of Slavic origin, and the southern part (around Bourkes) by Scandinavians. During the past 30 years, the population of the map-area has decreased considerably, owing to the abandonment of the farms and the general migration to centres of employment.

GENERAL GEOLOGY

The map-area lies between the Larder Lake and Destor-Porcupine Faults, in the broad "Abitibi" belt of volcanic rocks extending about 400 miles from Timmins, Ontario, to Chibougamau, Quebec. All known bedrock in the map-area is Precambrian. The general geology of most of the Ontario part of the belt is shown on the Timmins-Kirkland Lake sheet of the Ontario Department of Mines (Ginn *et al.* 1964).

The map-area, which comprises 216 square miles, contains rocks of every major division of the Precambrian stratigraphic column for the northern part of northeastern Ontario. The oldest rocks in the area are Keewatin-type mafic and felsic volcanic flows and pyroclastic rocks, with thin interbedded and (or) overlying beds of sedimentary rocks. Both are cut by Haileyburian-type mafic to ultramafic stocks and sills and by Algoman-type felsic stocks, cupolas, and a few sills or flows. The intrusive rocks, in turn, are cut by Matachewan-type mafic dikes. Gently-dipping Cobalt sedimentary rocks overlie all the above rocks. Overburden consists of glacial, swamp, and stream deposits. Much of the area formerly mapped as "greenstones" is gabbro and diorite, and several new areas of graphitic slate and chert were mapped. Some of the graphitic slate and chert or tuff is not exposed, and was discovered by follow-up drilling, by mining companies, based on airborne electromagnetic surveys.

ARCHEAN

Metavolcanics

Volcanic rocks, commonly called Keewatin "greenstones", are abundant in Black, Benoit, Lee, and Maisonville Townships. They can be divided into two groups recognizable in the field by colour and hardness. Most of the volcanic rocks in Black, Lee, and Maisonville Townships are basalt, andesite, mafic agglomerate, and mafic tuff. Metavolcanics in the northeastern part of Benoit Township are felsic; dacite, dacitic tuff, and dacitic agglomerate being the most abundant.

TABLE 1 | TABLE OF LITHOLOGIC UNITS

CENOZOIC

RECENT
Swamp and stream deposits

PLEISTOCENE
Sand, gravel, clay

Great Unconformity

PRECAMBRIAN

PROTEROZOIC

HURONIAN

COBALT GROUP

Gowganda Formation
Conglomerate, arkose, quartzite, greywacke, argillite

Unconformity

ARCHEAN

MAFIC INTRUSIVE ROCKS (MATACHEWAN)
Diabase

Intrusive Contact

FELSIC INTRUSIVE ROCKS (ALGOMAN)
Granite, hornblende-biotite granite, granite gneiss, syenite, syenite porphyry, quartz syenite, mafic syenite, lamprophyre

Intrusive Contact

MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS (HAILEYBURIAN, ALGOMAN, AND SOME KEEWATIN)
Serpentinite, peridotite, gabbro, diorite, may include some basalt

Intrusive Contact

METASEDIMENTS (TIMISKAMING OR KEEWATIN)
Slate, chert, tuff

Unconformity

FELSIC METAVOLCANICS (KEEWATIN)
Dacite, rhyodacite, rhyolite, silicic and intermediate tuff and agglomerate, dacite porphyry, amygdaloidal dacite, spherulitic dacite

MAFIC TO INTERMEDIATE METAVOLCANICS (KEEWATIN)
Basalt and andesite (pillowed and massive) may include some gabbro, mafic agglomerate and tuff, altered (bleached) mafic metavolcanics, andesite porphyry, amygdaloidal andesite, variolitic andesite.

Bourkes Area

MAFIC TO INTERMEDIATE METAVOLCANICS

Keewatin

Mafic to intermediate metavolcanics are the oldest rocks in the map-area. They consist mainly of pillowed and massive andesite and basalt, as well as tuff and agglomerate. Present in lesser amounts are andesite poryhyry, amygdaloidal andesite, variolitic andesite, and altered, "bleached", mafic volcanic rocks.

The basalt has dark brownish green weathered surfaces and dark grey to greenish black fresh surfaces. Some basalt, e.g. that in thick flows, is coarse-grained enough to be occasionally mistaken for gabbro. The weathered surface of andesite is pale brownish green, and the fresh surface is greenish grey. The grain size is fine to medium, except in andesite porphyry, which contains white feldspar grains. Some of the rock classified as andesite porphyry is flow material and some is probably tuff in which the large feldspar grains are tuffaceous fragments.

Amygdaloidal andesite contains sub-spherical vesicles partly filled with white calcite. These amygdules are $\frac{1}{16}$ inch in diameter. Variolitic andesite contains aggregations of sub-spherical material with radial fractures. These varioles consist of devitrified glass (palagonite). The aggregations are $\frac{1}{4}$ inch to 1 inch in diameter and are more resistant than the matrix because of their more silicic composition.

Agglomerate of mafic composition is not widespread. It contains subrounded fragments and bombs less than 1 foot long, and averaging about 4 inches. The composition of the matrix is slightly more mafic than that of the fragments. Most tuff is massive and interbedded with agglomerate. Elsewhere the rock was positively identified as tuff only if banded. Banded tuff differs from bedded chert (or rhyodacite tuff) in that it is softer and slightly coarser-grained.

Mafic volcanic rocks that are altered are near contacts of intrusions and form the wall-rocks of some quartz veins. Their "bleached" appearance is a result of silicification, albitization, sericitization, and carbonatization. In some places the altered rock contains disseminated pyrite.

FELSIC METAVOLCANICS

Keewatin

Some felsic metavolcanics are interbedded with the mafic metavolcanics, but most overlie them. The felsic metavolcanics consist mainly of pillowed dacite and dacite agglomerate. Present in lesser amounts are: massive rhyodacite and minor amounts of rhyolite; dacite tuff; dacite porphyry; amygdaloidal dacite; and spherulitic dacite. Few outcrops of felsic volcanic rocks contain appreciable sulphide minerals.

The dacite has brownish green weathered surfaces and pale green fresh surfaces, whereas the rhyodacite or rhyolite has pale green weathered surfaces and greyish white fresh surfaces. The range of hardness of their fresh surfaces is from 5 to 7 on Mohs' scale. Most of the dacite contains pillows. Dacite tuff, dacite porphyry, amygdaloidal dacite, and spherulitic (variolitic) dacite are the silicic equivalents of similar rocks described in the section on mafic metavolcanics.

The felsic agglomerate is greenish grey rock of dacitic composition. It contains angular sub-spherical to oblong fragments that are slightly harder than the matrix. The fragments are 2 inches or less in diameter, most being ¼ inch. Few outcrops of dacite agglomerate contain appreciable sulphide minerals. However, concentrations of base metals exist in dacite agglomerate or "rhyolite breccia" near Wolf and Goose Egg Lakes in Maisonville Township.

Metasediments

Timiskaming or Keewatin

Several areas of tightly folded, steeply dipping cherty slate and chert or tuff were found in Maisonville Township near Wolf and Goose Egg Lakes. Much of the cherty slate and chert is graphitic and was found under overburden by diamond drilling of electomagnetic conductive zones. Field evidence is insufficient to determine whether the cherty slate and chert are Keewatin-type (if interbedded with the metavolcanics in which they form small lenses) or Timiskaming-type (if the lenses overlie the metavolcanics unconformably).

Mafic and Ultramafic Intrusive Rocks

Haileyburian, Early Algoman, and Keewatin

Haileyburian-type mafic and ultramafic rocks intrude the metavolcanics in Black, Lee, and Maisonville Townships. Most of the gabbro and diorite is in Maisonville Township, where it makes up almost as much of the total area of outcrops as do volcanic rocks. Small areas designated on the map as mafic and ultramafic intrusive rocks might be early differentiates of granitic intrusions. Other small areas, such as those mapped as gabbro sills, might be medium- to coarse-grained basalt. Asbestos fibres were found in some outcrops of serpentinite, in particular the outcrop in Benoit Township, concession III, lot 11, south half, southeast quarter. Gabbro and diorite are typically coarse-grained, massive rocks that are sheared much less than the metavolcanics.

Felsic Intrusive Rocks

Algoman

Algoman-type pink granitic rocks cut the Haileyburian-type mafic and ultramafic rocks (Photo 3), as well as the Keewatin-type formations. Dikes and other offshoots of the main bodies are widespread. The largest areas of granite are: the part of the Watabeag Lake batholith that lies in Tolstoi and Terry Townships; and the part of the Winnie Lake stock that lies in Maisonville Township (Lovell 1967, p. 13; 1970). Granite gneiss exists at the contacts of these bodies with other rocks, and the central parts are pink medium-grained hornblende-biotite granite.

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Photo 3—"Algoman" granitic dikes cutting "Haileyburian" gabbro in a rock cut of Highway 11 north of the junction with the road to Butler Lake. The dikes dip from the upper right to the lower left of the photograph.

Syenitic rocks are much less abundant, most being in the form of dikes and cupolas, the majority of which are in Maisonville Township. Many of the syenitic rocks contain enough free quartz to be classified as quartz syenite and are pale pink in colour. In these two characteristics they differ from the reddish, less silicic syenitic stocks in Cairo Township east of Matachewan (Lovell 1967c, p.13) and in Otto Township (Lovel 1969b, p.25) south of Kirkland Lake.

Small amounts of mafic syenite and lamprophyre are present in the map-area. Some mafic syenite is an early differentiate of the syenite masses near the contacts of which it occurs and some is syenite contaminated by mafic country rocks. The former is the case where the contact of mafic syenite with intruded rocks is sharp, and away from the contact the mafic syenite grades into normal syenite. The latter is the case where the mafic syenite contains partly digested inclusions of country rock. The lamprophyre cuts syenite and older rocks and may be a late differentiate of a parent syenitic magma contaminated by mafic country rocks. According to Burrows and Hopkins (1914, p.33) lamprophyre in Maisonville Township, concession V, lot 4, contains numerous inclusions of greenstone and other rocks, simulating a conglomerate, and is of a type of conglomerate-like lamprophyres observed in the Cobalt and Kirkland Lake areas.

Mafic Intrusive Dikes

Matachewan

"Matachewan" dikes of gabbroic composition and diabasic texture cut all the above-mentioned formations. Weathered surfaces are dark grey or rusty brown and fresh surfaces are grey to greyish black. The dark grey fine-grained chilled margins are sometimes mistaken for basalt. Diabase intrusions altered the country rocks only slightly (chlorite and feldspar in the wall-rocks are altered to magnetite, pyrite, sericite, and calcite), and only within very short distances of their contacts. Most diabase dikes fill faults and joints striking within 15 degrees of north. An exception is the diabase dike at the Arctic Watershed roadside park, which strikes approximately east. The diabase of the Bourkes area is magnetic and otherwise similar to "Matachewan" diabase of adjacent map-areas.

PROTEROZOIC

Huronian

COBALT SEDIMENTARY ROCKS

Sedimentary rocks of the Cobalt Group constitute the bedrock in almost half of Lee Township and in small areas of Tolstoi, Black, Benoit, and Maisonville Townships. For 15 miles, 10 of them in the Bourkes area, the Cobalt sedimentary rocks form a south-trending belt covering the contact between the Watabeag Lake area granitic batholith and the "Abitibi" belt of volcanic rocks. Farther south, in the Gowganda-Elk Lake area, the belt of Cobalt sedimentary rocks merges with the northern edge of the main part of the "Cobalt Plain" (see Ginn *et al.* 1964).

In the Bourkes area, the "Coleman" (Lower Gowganda) Formation is the sole representative of the Cobalt Group. It consists of conglomerate, arkose (feldspathic sandstone), quartzite, greywacke (silty sandstone), and argillite (siltstone). They are fresh resistant clastic rocks that typically form flat-topped ridges, mesas, and other high land. All these types of Cobalt sedimentary rocks are intermixed and most outcrops contain more than one type. Stratigraphic sections are best exposed in Defiance Peak (in Black Township west of Butler Lake), and in cliffs in the northwestern part of Maisonville Township and the southwestern part of Benoit Township. The unconformity between basal Cobalt conglomerate and underlying Archean gabbro is exposed in Maisonville Township west of Highway 11, on the point of land between Swan Lake and its outlet, the White Clay River.

A good exposure of conglomerate of the Coleman (Lower Gowganda) Formation is situated in Maisonville Township, on Highway 11 north of the White Clay River bridge. Pebbles and boulders derived from older rocks of a wide area can be seen best on the stripped surface of the outcrop on the west side of the highway. Some of the rock types represented are: pink hornblende granite and porphyritic granite, grey biotite granite, granite gneiss, syenite, syenite porphyry, mafic syenite, diorite, gabbro, diabase, porphyritic diabase, rhyolite, andesite, amygdaloidal andesite, porphyritic andesite, jasper iron formation, and white vein quartz. The matrix

is greenish grey argillaceous quartzite. Pebbles and boulders constitute about 25 percent of the rock and are poorly sorted. Most are sub-angular to sub-rounded, and of low to medium sphericity, indicating a fairly short distance of transport. The ratio of felsic to mafic pebbles is about 3 to 2, and feldspar and rock fragments are present in much greater volume than quartz and chert, indicating the conglomerate is more the product of physical erosion than of chemical weathering.

However, weathered surfaces of some of the pebbles and boulders, those of diabase in particular, are much thicker (maximum 6 inches) than weathered surfaces developed in pebbles, boulders, and outcrops since Pleistocene time (maximum ½ inch in the same rock types that were measured in the conglomerate). This suggests a much longer period of weathering or else more intense chemical weathering in the environment of formation of Cobalt conglomerate than during and since Pleistocene glaciation. Also, all outcrops of Cobalt sedimentary rocks contain some evidence of water action such as graded bedding, which is more rare in Pleistocene till.

The general consensus of opinion is that conglomerate of the Gowganda Formation is tillite and several of its characteristics support this hypothesis. However, the physical weathering and evidence of water action might also be the result of block faulting and stream action. The present distribution and petrological characteristics of the Cobalt sedimentary rocks in the Bourkes area suggest they might represent beds of fiords. The main belt of Cobalt sedimentary rocks, which covers the contact of the Watabeag Lake granitic batholith with Keewatin-type volcanic rocks in Tolstoi, Black, Lee, and townships south of the map-area, may represent the bed of a "fiord-and-river" system tributary to the "Cobalt Plain" of Huronian sedimentary rocks in the Gowganda-Elk Lake area to the south. The eastern belt of Cobalt sedimentary rocks, in Black, Benoit, Maisonville, and Lee Townships, appears to be a tributary to the main belt.

CENOZOIC

Pleistocene and Recent

Most of Tolstoi and Terry Townships is covered by parabolic sand dunes transported from the large Watabeag Lake Esker (1 mile west of the map-area) by prevailing northwesterly winds during post-glacial time (see Photos 1 and 2). Sandy boulder till covers most of Black, Lee, and Maisonville Townships, but a gravel esker and sandy delta cover about 10 square miles in the vicinity of Butler and Malloch Lakes. This esker-delta complex trends south from the part of the Great Clay Belt north of the northern boundary of Black Township to the Little Clay Belt at Kenogami Lake.

The soil of the farmland in Benoit Township and the northern part of Maisonville Township is predominantly fine sand and clay of the southern reaches of the Great Clay Belt. The silt and clay soil in the southwestern part of Maisonville Township is part of the northern reaches of the Little Clay Belt, the soil of which is predominantly silt. Although Lake Barlow-Ojibway extended from the southern end of Lake Timiskaming northward across the continental divide (Hughes 1960), the only place where the Great Clay Belt and the Little Clay Belt merge is in the map-area (see distribution of Lake Barlow-Ojibway varved sediments on the surficial

geology map by Hughes 1960). In Maisonville Township west of Highway 11 at the height of land, a narrow belt of silt and clay joins the Great Clay Belt, in the vicinity of the White Clay River (which is part of the James Bay river system), to the Little Clay Belt, in the vicinity of the Blanche River (which is part of the St. Lawrence River system).

Glacial fluting, exemplified best in the eastern parts of Tolstoi Township, (see Photo 1) indicates an ice movement direction of S10E.

STRUCTURAL GEOLOGY

Folds

The Bourkes area metavolcanics are situated between the western flank of the Noranda volcanic dome in the east, the Watabeag Lake area granitic batholith in the west, the Kirkland Lake-Larder Lake belt of predominantly sedimentary rocks in the south, and the Timmins-Matheson belt of predominantly sedimentary rocks in the north. The major fold in Bourkes area volcanic rocks is a syncline, the axis of which plunges from the northern part of Black Township southeastward across Benoit Township. Evidence for the location of the synclinal axis in Benoit Township is given on the accompanying map (Map 2215, back pocket). The extension of the syncline through Black Township is indicated by aeromagnetic contours (Geol. Surv. Canada 1956d). Top determinations for the northern limb are given by Moore (1936, p.14), and those for the part of the southern limb in Black Township are shown on Map 2213 (back pocket). Most of the underlying strata are basalt and andesite and the upper strata are dacitic. On the "Ramore" Aeromagnetic Map (Geol. Surv. Canada 1956d) this relationship is clearly delineated by strong magnetic contours (over the andesite and basalt) skirting the weakly magnetic area of dacitic rocks in the northeastern part of Benoit Township. Gabbroic and granitic stocks intrude the "nose" of the syncline in northern Black and Benoit Townships, where the strike of the volcanic strata and corresponding magnetic contours is distorted.

The western limb of a north-plunging synclinorium, possibly younger than the southeast-plunging syncline, occurs in the volcanic rocks of Lee Township and the four southern concessions of Maisonville Township. Its principal axis plunges north through the eastern part of Maisonville Township. Most of its eastern limb (and the north-striking axial area of the adjacent anticline) is obliterated by the Winnie Lake granitic stock. Northward, the strike of formations changes from north in the north-plunging synclinorium, to northwest in the southeast-plunging syncline. This occurs in the two northern concessions of Maisonville Township. The north-plunging synclinorium might be younger than the southeast-plunging syncline, which is parallel to the regional trend of the "Abitibi" belt of volcanic rocks that extends from Timmins to Chibougamau. Contours on the "Kirkland Lake" and "Ramore" Aeromagnetic Maps (Geol. Surv. Canada 1956a and d) indicate the change in strike of formations from the synclinorium to the syncline, and outline the Winnie Lake granitic stock.

Cobalt sedimentary rocks fill depressions in the surface on which they were deposited and their dip is gently inward, except for soft sediment slump structures.

Table 2 PROPERTY FILES FOR THE BOURKES AREA ON FILE AT THE ONTARIO DEPARTMENT OF MINES RESIDENT GEOLOGIST'S OFFICE IN KIRKLAND LAKE

PROPERTY NUMBER	FILE NAME	TOWNSHIP	DATE OF WORK	TYPE OF WORK
1	Black Creek Gold Mines Ltd.	Black	1946	GR, A
23	Bourkes Syndicate Gold Mine (Davidor)	Benoit	1937 & 1945	UG, GR, 8 DH
13, 16	Campbell-Jeanjacquet	Lee	1963, 1966 & 1968	4DH
20	Carlson, O.	Benoit	1946	GR
21	Chamandy, K., & Mokta	Benoit	1948 & 1968	GR, IP, M, 1 DH
34	Cole	Maisonville	1952	GR
35	Elzina Mines Ltd.	Maisonville	1961	GR
24	Erickson, K.J.	Benoit	1956	GR
2	Gipsy Gold Mines Ltd.	Black	1938 & 1945	P, GR
36	Golden Summit Mining Co. Ltd., The	Maisonville	1927 & 1930	GR
3	Gray, J.J.	Black	?	1DH
4	Hagen-McCrea	Black	1964	P, 10 DH
25	Hagen, Ole	Benoit	1951	3DH
37	Hastings-Moffat	Maisonville	1934 & 1940	A, 5 DH
5	Henderson, S.	Black	1947	GR
6	International Nickel Co. of Canada Ltd., The	Black	1966	7 DH
15	International Nickel Co. of Canada Ltd., The	Lee	1964	2 DH
38	International Nickel Co. of Canada Ltd., The	Maisonville	1965	1 DH
16	Jeanjacquet (see Campbell-Jeanjacquet)	Lee		
39	Kerr Addison Mines Ltd. "Goose Lake group"	Maisonville	1965 to 1970	8 DH
40	Kerr Addison Mines Ltd. "Kapakita group"	Maisonville	1966	1 DH
41	Labine-Smith	Maisonville	1914	G
42	Langs, John G., Trustee (Wolfe Lake Mines Limited)	Maisonville	1937	GR, 7 DH
17	Lee Gold Mines Ltd.	Lee	circa 1936	G, UG
43	Lee, Mrs. O.M., Estate (Bradford Syndicate)	Maisonville	1946, 1947	GR
7	Legend Gold Mines Ltd.	Black	1946	GR
44	Murray, John E. (Trapper claim; Watling)	Maisonville	1912, 1952	GR, DH
27	Noranda Exploration Co. Ltd.	Benoit	1967	G, M, EM
8	North Expo Mines Ltd.	Black	1966	GR, P, SP, G
45	Pain, Sidney A.	Maisonville	1958	3 DH
46	Peterson, Warren	Maisonville	1952	GR, 3 DH
47	Pudden, A.	Maisonville	1955	16 DH
48	Russell, J.G.	Maisonville	1951	GR
9	Selco Exploration Co. Ltd.	Black	1960	1 DH
49	Sesekinika Townsite	Maisonville	1934	GR
30	Skjonsby, K.E.	Benoit	1955, 1958, 1959	11 DH
10	Solmes, W.P., and O'Connor, Francis T.	Black	1957, 1958, 1964	GR, 6 DH, G
50	Ventures Claims Limited (Hoyle Mining Co. Ltd.)	Maisonville	1947, 1948, 1952	9 DH
11	White-Karry Gold Mines Ltd.	Black	1945	P, 9 DH, GR
51	Wickstead	Maisonville	1948	GR

A — assay plan
DH — diamond drill hole
G — geological map
GR — geological report
IP — induced polarization survey
M — magnetometer survey
EM — electromagnetometer survey
P — prospectus
SP — self potential survey
UG — underground geology

Faults

Most faults are in metavolcanics. They strike north, approximately parallel to the diabase dikes and to the formations in Lee Township and the four southern concessions of Maisonville Township. The faults are perpendicular to the axis of the older fold, the southeast-plunging syncline.

East-striking syenite dikes in Maisonville Township intruded what might be a younger system of faults, perpendicular to the axis of the younger fold, the north-plunging synclinorium.

Shear Zones

Most shear zones are in metavolcanics, strike north to northwest (parallel to the volcanic strata in which they occur), and probably result from folding. A prominent exception is the Wendwright Creek shear zone, which strikes northeast along the contact of the Winnie Lake granitic intrusion.

ECONOMIC GEOLOGY

Base metals, gold, and silver are present in economically interesting concentrations. Zinc, lead, and copper occur in quartz-carbonate veins and altered zones in graphitic cherty slate and chert or tuff, as well as in rhyolite breccia, and in sheared dacite, andesite, and basalt. Copper occurs also in quartz veins associated with gabbro, diorite, and granitic rocks. Nickel is in gabbro and diorite and in nearby metavolcanics. Molybdenite is in quartz veins, many of which are associated with granite and syenite. Gold is in grey and white quartz and quartz-carbonate veins and shear zones, much of the gold being associated with syenite. Silver is associated with gold and lead. A few serpentinite outcrops contain asbestos. Esker and glacial outwash sand and gravel are abundant in the map-area except in the silt and clay lowland of Benoit Township.

DESCRIPTION OF PROPERTIES

The Timmins-Kirkland Lake Geological Map of the Ontario Department of Mines (Ginn *et al.* 1964) shows the location of the map-area with respect to the Kirkland Lake-Larder Lake gold, copper, and iron mines, the Porcupine gold and base metal mines, and the gold, asbestos, and copper mines east of Matheson.

Benoit Township

BERGSTRAND [*circa* 1921] (18)*

This claim is in Benoit Township, concession IV, lot 11, south half, southeast quarter. According to Wright (1921, p.56) low assays of gold have been obtained from the poryhyry dikes and some of the veins. A plan of the geology in the vicinity of the showings is presented by Wright (1921, p.56).

BUNTING (JOHNSON) [*circa* 1920] (19)

In Benoit Township, concession 1, lot 9, south half, southwest quarter and northwest quarter, quartz-carbonate veins in rusty schistose carbonate zones were stripped and test pitted. These have been described by Wright (1921, p.55), who stated:

> *Bunting Claims (Johnson) Nos. 6639-6640.*—These claims comprise the west half of lot nine in the first concession of Benoit. On claim No. 6640 most work has been done. The greenstones, with some pillow lava structure and volcanic fragmental rocks, are cut by dolerite (diabase?) dikes. In close proximity to these intrusions are some well defined mineralized veins. Test pits have been sunk and stripping done on several of these. Near the southern boundary of this claim a shallow test pit has been sunk close to a vein junction, on a parallel quartz-vein system in a schistose zone. To a depth of three to four feet the schistose greenstone has been altered to a rusty carbonate. There is much mineralization with sulphides principally iron pyrites. The foregoing vein strikes north approximately, and immediately south of the test pit it is intersected by a quartz vein striking northeast. This latter is bordered by a narrow felsite dike.

O. CARLSON [*circa* 1946] (20)

Benoit Township, concession 1, lot 1, north half, northwest quarter and southwest quarter, as well as lot 2, north half, northeast quarter and southeast quarter, were owned in 1946 by O. Carlson, O. Hagen, and J. Ketterin of Bourkes, according to a brief report (in ODMNA files, Kirkland Lake) by J. J. Harris, exploration geologist for Wright-Hargreaves Mines Limited. The main showing is along the northern boundary of concession 1, lot 2, north half, southeast quarter. It consists of quartz-carbonate stockworks containing pyrite, chalcopyrite, native bismuth, niccolite, and fine native gold that gave assays of $8.05 to $18.20 in gold (gold at $35. per ounce) (Harris). An x-ray hole drilled to intersect the zone below the highest grade pit returned 2.2 feet assaying $10.00. A hole directly below picked up the zone of brecciation but contained little or no gold. Similar poor results were obtained from an X-ray drill hole 300 feet to the southwest. Two 700-foot drill holes, one of which intersected the zone, contained no gold.

*Number in brackets refers to property number on Maps 2213, 2214, and 2215, back pocket.

K. CHAMANDY [*circa* 1948], AND MOKTA CANADA LIMITED [1968] (21)

In Benoit Township, concession V, lot 10, south half, northeast quarter, Mr. Kelly Chamandy sank pits in northwest- and northeast-striking quartz stringers cutting sheared mafic volcanic rocks. The quartz stringers contain blebs of chalcopyrite and minor amounts of silver.

In concession V, lot 10, north half, northeast quarter, pits were sunk in a silicified zone in pillowed basalt. The silicified zone, which is 6 to 8 feet wide, contains a quartz breccia vein 6 inches wide. The vein strikes N25E and dips 75NW. Old core remains as evidence of x-ray drill holes.

In concession VI, lot 10, south half, northeast quarter, the strike of the contact between syenitic rocks and pillowed basalt is very irregular and is a zone at least 50 feet wide. Near an old wagon road (not found by author), a pit has been sunk in syenite containing pyrite and chalcopyrite and, in grab samples, 0.10 ounce of gold per ton (report by W. S. Savage, former ODM Resident Geologist, Kirkland Lake).

In concession V, lot 10, north half, southeast quarter, south half, northeast quarter, and south half, southeast quarter, during 1967 and 1968 Mokta Canada Limited completed magnetometer and induced polarization surveys and drilled one hole (ODMNA files, Kirkland Lake). The hole intersected numerous carbonate stringers containing small amounts of chalcopyrite.

COTTERILL [*circa* 1921] (22)

These claims are in Benoit Township, concession I, lot 7, south half, northwest quarter and northeast quarter. In the northeast quarter are two parallel veins, not found by author, 30 feet apart striking east and dipping 45 south (Wright 1921, p.56). The wall-rock is somewhat schistose mafic fragmental volcanic rocks altered to chlorite and impregnated with pyrite. In the northwest quarter, a quartz vein system less than 6 feet wide strikes northeast through granitic and mafic volcanic rocks. A test pit was sunk on the vein system. According to Wright (1921, p.58), assays from $3 to $24 in gold per ton (gold about $20 per ounce) were reported.

DAVIDOR MINES LIMITED (23)

This property is in Benoit Township, concession II, lot 8, north half, lot 9, south half, and lot 10, south half. Most of the work was done in lot 9, south half, where in 1917 Oscar Anderson discovered gold on his farm. According to Burrows (1917, p.249) the gold and gold-silver tellurides were in southeast-striking, steeply dipping, quartz-carbonate veins and lenses in a carbonate shear zone in mafic volcanic rocks. The maximum width of the lenses is 1 foot and the veins are a fraction of an inch to several inches wide. The maximum width of the shear zone is 3 feet. The shear zone contained much pyrite and some chalcopyrite, galena, and molybdenite. According to Wright (1921, p.55) stringers of pink feldspathic material, as well as narrow felsitic dikes, have intruded the green contorted schist. In places the wall of the shear zone is well marked and elsewhere merges into the adjoining rocks.

ODM8498

Photo 4—Headframe of the former gold producer at Bourkes, with part of the mill to the right.

Between 1917 and 1920 a two-compartment shaft was collared on the main vein and sunk to a depth of 400 feet (Photo 4) by Bourkes Mines Limited. The following drifting was done: 600 feet on the first level; 450 feet on the second level; 180 feet on the third level; and 320 feet on the fourth level. The shear zone is exposed along the entire development on all levels, but the ore was confined to the quartz-carbonate lenses, and only 5,331 pounds were milled in 1918, at the McIntyre mill in Timmins (Langford 1937).

During 1920, the underground workings were allowed to flood and thereafter the property passed through several hands, largely under options. In 1933, the mine was sold to Tellaurum Gold Mines Limited, which dewatered and resampled the workings. Some ore was mined by Bourkes Syndicate in 1936 and 1937 and by Mesabi Gold Mines Limited in 1938. The total production was 277 ounces of gold and 50 ounces of silver, from 1,298 tons milled. From December 11th, 1946 until February 11th, 1947, Davidor Gold Mines Limited operated a test mill and more than 315 tons grading more than $5.00 per ton were milled (Thompkins 1947).

K. J. ERICKSON (24)

In Benoit Township, concession II, lot 5, north half's central part, pits were sunk in a quartz-carbonate stringer zone, 3 to 5 feet wide, along a slightly sheared

flow contact striking N60E and dipping 60NW (Resident Geologist's files, Kirkland Lake, *circa* 1958). The stringers contain erratic, sparsely disseminated, chalcopyrite.

OLE HAGEN (25)

In Benoit Township, concession III, lot 11, south half, northwest quarter and northeast quarter, three holes drilled in 1951 intersected asbestos veinlets in serpentinite. The asbestos is very short cross-fibre chrysotile.

DANIEL G. KEEFE (26)

(West Half of Skjonsby-Klanderland)

In Benoit Township, concession I, lot 2, north half, northwest quarter, pits have been sunk on a series of gently dipping quartz veins cutting mafic volcanic rocks. In one pit, about 8 feet deep, five quartz veins were exposed, each being 1 to 3 inches wide. The margins of the veins and the wall-rock contain considerable pyrite. A few assays of $2.00 to $9.00 (gold at $20.67 per ounce) in gold per ton (Burrows 1917, p.251), one of $21.00 (gold at $20.67 per ounce) per ton (Wright 1921, p.60), and as high as $32.20 (gold at $35 per ounce) per ton, with many around $2.00 per ton, (Cunningham 1962) were reported.

In the southwest quarter's northeast part, a quartz-minor feldspar vein system, 2 to 8 feet wide, was reported to have yielded low assays of gold (Burrows 1917, p.251).

NORANDA EXPLORATION COMPANY (27)

Geological, electromagnetic, and magnetic surveys were done in 1967 by Noranda Exploration Company in Benoit Township, concession III, lot 4, north half, northwest quarter and southwest quarter; lot 5, north half; concession IV, lot 4, south half, northwest quarter and southwest quarter; and lot 5. Two parallel weakly conductive zones were found, trending east. The results are in the ODMNA files, Kirkland Lake.

R. S. POTTER (28)

(Wickstead-Maloof) [*circa* 1920]

In Benoit Township, concession I, lot 4, north half, northwest quarter, a 40-foot inclined shaft was collared on a quartz vein cutting mafic volcanic rocks. The quartz vein is 210 feet long and 1 foot wide (average). It strikes northeast and dips 45SW to almost horizontal. Along the footwall between the vein and the volcanic rocks is a felsite dike containing considerable pyrite and some chalcopyrite and galena. Native gold was seen in places (Wright 1921, p.55).

SCOTVOLD-NELSON [*circa* 1921] (29)

Work has been done on a former Scotvold claim (Benoit Township, concession I, lot 5, north half, southwest quarter) and the adjacent claim to the north, which formerly belonged to Nelson. According to Wright (1921, p.56) Mr. Scotvold reported $3 in gold per ton (gold at about $20 per ounce) from a pyrite-containing lamprophyre dike. The dike, not found by author, strikes north across the two claims, between diabase on the west and mafic volcanic rocks on the east.

K. E. SKJONSBY (30)

In Benoit Township, concession I, lot 9, south half, northeast quarter, five short holes were drilled, in 1959, by K. E. Skjonsby; total drilling x-ray, 695.6 feet; three holes were from the same set up and two were about 1,000 feet away. The holes intersected quartz stringers, of various attitudes, cutting mafic volcanic rocks, gabbro, and syenite dikes. The quartz stringers and syenite dikes contain some sulphide minerals (from ODMNA files at Kirkland Lake).

AXEL SWORD (31)

(Part of the Former Webb Claims, [*circa* 1921]

In Benoit Township, concession II, lot 7, south half, the southwest quarter contains gold in gently dipping veins near the road allowance (Wright 1921, p.59). The basalt and gabbro country rock, which is liberally impregnated with pyrite cubes, is intruded by a sulphide-containing pink mafic syenite dike striking southeast across the road allowance. South of the road (outside the Sword claim), a shaft has been sunk on the contact of the syenite dike with basalt.

THOMPSON-McLEOD [*circa* 1921] (32)

These claims are in Benoit Township, concession III, lot 4, north half, northwest quarter and southwest quarter, and lot 5, north half, northeast quarter and southeast quarter. Wright (1921, p.58) gave the following description:

> . . . The principal workings consist of an inclined shaft following the dip of a 16 inch wide vein striking south 8 degrees east and dipping about 65 degrees east, cutting a grey lava knoll. On the surface about 15 feet distant is another vein 4 inches wide with parallel dip and strike. From the west side of the knoll an adit has been driven along the strike for 60 feet. The adit connects with the main shaft about 20 feet below the surface. As the shaft was filled with ice to the level of the adit examination at depth was not possible, but the vein is reported to be several feet wide at the bottom of the shaft. The wall rock is schisted for a few feet on either side of the vein. The quartz is of milky white color, and in places it is stained with iron oxide. The wall rock and border of the vein are mineralized with pyrite. Free gold is reported to have been found in several places along the vein.

Black Township

BLACK CREEK GOLD MINES LIMITED [*circa* 1946] (1)

In Black Township, east central part, a group of claims extending about 7,000 feet south from Boisvert Lake was owned in 1936 by Mitchell. About ½ mile west of the northern end of Benoit Lake, a shear zone, in mafic volcanic rocks, striking N40W and dipping vertically was stripped and trenched for 1,200 feet, mostly in claim L28114. The shear zone is 5 to 28 feet wide, and is intruded by irregular masses of quartz and carbonate containing irregular concentrations of pyrite, with which gold is associated. Fourteen representative grab samples assayed by Lake Shore Mines Limited in 1936 contained an average of about $5.00 worth of gold per ton (gold at $35 per ounce).

In 1946, 16 holes, totalling 1,730.8 feet, were drilled by Black Creek Gold Mines Limited within 250 feet of each other. An average of about $3.00 in gold per ton (gold at $38.50 per ounce) across an average intersection of about 8 feet was obtained in 9 holes along a strike length of 225 feet.

A shear zone, in mafic volcanic rocks, 700 feet southwest of the main shear zone is indicated, by trenching, to be 150 feet long and 2 to 4 feet wide.

GIPSY GOLD MINES LIMITED [*circa* 1947] (2)

In Black Township, west of Woollings Creek and northwest of Meyers Lake, and west of the former property of White-Karry Gold Mines Limited (property 11), trenching and sampling was done in 1945.

According to J. W. McBean, former Resident Geologist, (1945 ODMNA files, Kirkland Lake), the first trenching was done near the southeastern corner of claim L29283. A few glassy quartz stringers with minor amounts of coarsely crystallized pyrite were exposed in massive "recrystallized basalt" or gabbro. No commercial percentages in gold were reported. The author didn't find either outcrops or trenching.

Shallow pits and rock trenches were opened up on the central part of claim L31646. The rock exposed is silicified agglomerate and tuff interbedded with porphyritic trachyte flows. Pyrite is present throughout the entire section trenched, and a few narrow rusty shear zones contain massive pyrite. According to McBean, about $2.00 to $3.00 in gold per ton (gold at $38.00 per ounce) was reported.

J. J. GRAY [*circa* 1947] (3)

In Black Township, central part, on unpatented claim L81822, about 600 feet west of Errett Lake, a 450-foot hole drilled about 1945 intersected sulphide-bearing quartz stringers cutting basalt or gabbro. In addition, two short holes were drilled about 3,000 feet south of Errett Lake; the results of the drilling are unknown.

In 1969, 5 holes were drilled in surveyed claim L28116. The core consisted of metavolcanics cut by quartz stringers.

HAGEN-McCREA (4)

In Black Township, central part, near McVittie Lake, samples were obtained in 1936 by Erie Canadian Mines Limited (ODMNA files, Kirkland Lake) from claims owned by Wilbert E. Van Clieaf. Assays from the main trench indicated about $3.00 in gold per ton (gold at $35 per ounce) across an average of 3 feet, for a length of 25 feet.

In 1948, 16 holes, totalling 879.4 feet, were drilled in the northwestern part of McVittie Lake and as much as 4,000 feet farther west (on former claims L46515, L46516, L46520, L46522, and L46524). The drilling encountered numerous intersections of pyritic graphitic chert and schist, interbedded with mafic and felsic rocks.

In 1964, Monpre Mining Company Limited issued a prospectus indicating it then held nine unpatented claims near McVittie Lake.

S. HENDERSON [*circa* 1947] (5)

In Black Township, northern part, along the boundary with Playfair Township, trenching and assaying was done in 1947. In the eastern half of former claim L49209, some work was done on a rusty shear zone, 4 feet wide, that strikes N60W and dips 85N. The shear zone cuts fine-grained felsic volcanic rocks containing an erratic weak dissemination of pyrite and minor amounts of chalcopyrite. Also, minor amounts of gold and silver were reported (W.S. Savage, unpublished ODM report in Kirkland Lake files).

About 400 feet east of the No. 3 post of former claim L52440, slightly porphyritic diorite is exposed in a small pit. The diorite contains pyrite and one gold assay of $11.50 (gold at $35 per ounce) was reported; minor chalcopyrite and sphalerite were also reported (Savage).

Savage (ODM report, Kirkland Lake files) reports that in the northeast quarter of claim L48416, on the side of a hill of mafic rock, an irregular shear 1 to 3 feet wide strikes N40E and dips vertically. The shear, in andesite along the contact of a gabbro dike at least 8 feet wide, was exposed by trenching. Pyrite is present in irregular quartz stringers in the shear, as well as in the wall-rock, and $7.00 to $46.00 in gold per ton (gold at $35 per ounce) were reported. The highest concentrations are in the sheared andesite.

In 1966, self-potential and geological surveys were carried out on the property by North Expo Mines Limited.

THE INTERNATIONAL NICKEL COMPANY OF CANADA LIMITED [*circa* 1966] (6)

In Black Township, northeast quarter, from 1964 to 1966, Inco drilled seven holes, totalling 3,761 feet, in a gabbroic stock and nearby graphitic sedimentary rocks and volcanic rocks northwest of Butler Lake. The economic results of this drilling are unknown.

LEGEND GOLD MINES LIMITED [*circa* 1946] (7)

In Black Township, central part, about ¼ mile west of Errett Lake, several claims were purchased in April 1946 from George Critchley by D.M. Morin and C.A. Palangio for Legend Gold Mines Limited. The property is underlain by volcanic rocks intruded by dikes of granodiorite and feldspar porphyry. Two quartz-filled shear zones have been stripped and trenched.

In a shear zone on former claim L25703, two quartz veins, 2 to 3 feet wide, contain fine-grained pyrite and chalcopyrite and $0.70 to $11.00 worth of gold per ton (gold at $35 per ounce) along a strike length of about 300 feet.

In a shear zone on former claim L45298, a pyrite-bearing quartz vein was traced southeast for a length of almost 2,000 feet. Four chip samples across 12 to 14 inches contained from $6.30 to $33.60 in gold per ton (gold at $35 per ounce). This and the above information is from ODMNA files at Kirkland Lake.

A third shear zone, on the boundary of former claims L42299 and L45388, had not been worked for a long time when, in 1946, G.F. Ennis (ODMNA files, Kirkland Lake) obtained grab samples containing $0.35 and $1.05 in gold per ton (gold at $35 per ounce).

NORTH EXPO MINES LIMITED (8)

In Black Township, west central part, northeast of Lower Hewitt Lake, considerable stripping and drilling were done in 1948 for George Keller. On former claim L53678, a gently dipping quartz vein contains galena and chalcopyrite, as well as brown carbonate and red aplitic stringers. On the northern slope of a ridge in the southeast quarter of claim L53680, two quartz veins, 1 to 3 feet wide, follow the strike (S55E) and dip (vertical) of a shear zone. The wall-rocks contain disseminated pyrite, but little gold. Another shear in "greenstone" is exposed in the south wall of a pit on the top of the hill. North of the shear, in the pit, the basalt near aplite stringers contains pyrite and galena. A maximum of $2.40 in gold (gold at $35 per ounce) and 5 ounces of silver per ton in grab samples were reported (W.S. Savage, unpublished ODM report in Kirkland Lake files).

In 1953, North Denison Mines Limited acquired many of the claims formerly held by George Keller. North Denison carried out a resistivity survey and subsequently drilled a hole into each of four east-trending conductive zones. A total of 1,940 feet of drilling was done, which returned very low assays for gold across short intersections.

Further work by North Expo Mines Limited in 1967 consisted of a self-potential survey, some sampling, and one 504-foot drill hole. Results indicated low concentrations of copper and gold.

Stripping and trenching were done in 1968 by Richard Bugow and in 1969 by Louis Mantha about 1,000 feet north of the northern end of Lower Hewitt Lake.

SELCO EXPLORATION COMPANY LIMITED (9)

In Black Township, northeast quarter, about ¼ mile west of the northern end of Butler Lake, Selco drilled a 346-foot hole to test a northeast-striking conductive zone. The core consisted of mafic volcanic rocks and banded graphitic chert with disseminated pyrite.

W. P. SOLMES AND F. T. O'CONNOR [*circa* 1964] (10)

In Black Township, northeast part, west of Butler Lake, numerous old pits and trenches indicate that considerable work was done on zinc-lead-copper showings by former owners. The nucleus of the Solmes-O'Connor claim group was held, in 1966, by Hiskerr Gold Mines Limited.

The main showing is in the western half of patented claim L23555, where a shear zone in mafic and felsic agglomerate strikes about N20E and dips steeply SE. The shear zone consists of chloritic material and interbanded calcite and quartz, and contains high concentrations of sphalerite, pyrite, and galena, with minor amounts of chalcopyrite.

About ¼ mile northwest of the main showing, on patented claim L23556, felsic volcanic rocks contain fine-grained disseminated pyrite and pyrrhotite, as well as stringers of pyrrhotite.

About ¼ mile northwest of the "pyrrhotite" showing, on unpatented claim L78581 (the claim west of patented claim L21762), a pit was sunk in felsic agglomerate. Here, quartz-carbonate stringers contain pyrite and small amounts of sphalerite, chalcopyrite, and galena.

About 2,000 feet southeast of the main showing, in the northwest corner of claim L82111 (south of the southeastern part of patented claim L23548), a few blebs and narrow stringers of sphalerite and galena are present in mafic agglomerate.

Six holes, totalling 2,089.4 feet, were drilled in 1957 and 1958 by W.P. Solmes and F.T. O'Connor on surveyed claim L63753 and on the former unsurveyed claims L63761, L63738, and L63747. The holes intersected quartz diorite, feldspar porphyry, and "greenstones" (ODMNA files, Kirkland Lake).

WHITE-KARRY GOLD MINES LIMITED [*circa* 1948] (11)

In Black Township, south-central part, west of Woollings Creek and northwest of Meyers Lake, claims were staked east of Gipsy Gold Mines Limited property (2), by G. Addison and associates. The principal showing is a quartz-carbonate stockworks in claim L46041, about 35 feet east of the No. 2 post of L35174. According to J.W. McBean, former Resident Geologist (in ODMNA files, Kirkland Lake) the central zone strikes approximately N10W and in 1945 was cross-sectioned by five shallow trenches, along the quartz veins, along a length of 120 feet. The southern end of the trenched zone is in fine-grained basalt, and the central and northern sections in fragmental volcanic rocks. A narrow dike of feldspar porphyry is exposed in one of the trenches. South of the trenched area, coarse-grained basalt or gabbro was observed. Quartz-carbonate stringers 2 to 6 inches wide strike

N10W through the fragmental volcanic rocks. Over an ideal section of 18 feet across the strike, the quartz-carbonate stringers are numerous and bear native gold and also coarse crystals of pyrite in shears and small rock inclusions.

In late summer, 1945, Wright-Hargreaves Mines Limited secured a short term option from Herbert Addison and others, and drilled seven x-ray and two standard drill holes; only the two end holes are shown on the map. Soon after, the claims were acquired by Gipsy Gold Mines Limited, which was reorganized as White-Karry Gold Mines Limited. In 1947, White-Karry re-drilled the zone from which good surface samples were obtained by Wright-Hargreaves and which the x-ray holes had shown to be unexpectedly shallow. White-Karry also drilled on the projected northwest and southeast extensions, a total of 24 holes (5,885 feet), only two holes are shown on the map as they were drilled close together. In addition, five holes were drilled 1,200 feet farther southeast along strike and one hole was drilled from an off-strike outcrop northwest of the main outcrop. Most of the Wright-Hargreaves and White-Karry drill holes along a strike length of 1,400 feet obtained an average of about 2½ feet of core containing $4.00 worth of gold per ton (gold at $35 per ounce). Part of this length is on claim L46038, which belongs to Wilfred John Addison. Also, a drill hole that obtained 1½ feet of core containing $10.85 worth of gold per ton is on claim L35172 of John A. White.

Lee Township

MILDRED CAMPBELL (13)

In 1965 and 1966, on claims L76830 and L76809, which straddle part of the contact between Cobalt sedimentary rocks and Keewatin-type volcanic rocks, two holes, totalling 1,144 feet, were drilled. The core of the western hole consists of Cobalt sedimentary rocks, mafic volcanic rocks cut by quartz-carbonate stringers, and mafic intrusive rock. The eastern hole intersected mafic volcanic rocks cut by a feldspar porphyry dike, 1 foot wide (ODMNA files, Kirkland Lake).

NORMAN A. CAMPBELL (14)

Bedrock on the property, northwest of Swan Lake, consists of volcanic rocks cut by gabbro, and overlying Cobalt sedimentary rocks. Trenching on claims L16254 and L16270 is shown on a surface plan by Sylvanite Gold Mines Limited when the property was owned by Lee Gold Mines Limited (*circa* 1940). Assays of quartz float discovered near the common boundary of the claims were $2.70 and $6.00 worth of gold per ton (gold at $35 an ounce).

THE INTERNATIONAL NICKEL COMPANY OF CANADA LIMITED (15)

In 1964, one Winkie drill hole ¼ mile south of Meyers Lake and another ½ mile southwest of Meyers Lake intersected graphite schist (ODMNA files, Kirkland Lake).

FRÉDÉRIC JEANJACQUET (16)

A 1,503-foot hole drilled in 1963, on claim L74550, in southeast Lee Township, intersected mafic and felsic volcanic rocks, in places well mineralized with pyrite. A 303-foot hole drilled in Cobalt conglomerate and quartzite near the southeastern corner of claim L74551 contained disseminated fine-grained pyrite, and specks of molybdenite (ODMNA files, Kirkland Lake).

LEE GOLD MINES LIMITED (17)

A shaft section and composite surface and 125-foot level plan by Sylvanite Gold Mines Limited indicate the shaft, which is inclined 75 degrees to the northeast, was sunk on quartz-carbonate veins cutting sheared altered basalt. This shaft was sunk in 1931 and has 250 feet of drifting on the 125-foot level. The bottom of the sump is at 130 feet (ODM 1932, p.78). The veins contained red feldspar, pyrite, and gold.

Trenching and drilling were done on the second claim north of the shaft claims of Lee Gold Mines Limited, that is, between claim L16228 and the common boundary of Lee and Maisonville Townships, by Denby Scales and by Harris and Harlow. According to a report in 1931 by the general manager of Sylvanite Gold Mines Limited (Sylvanite Gold Mines Limited 1931), no assays over mining width showed even a $3.00 average (with gold about $20 per ounce).

Maisonville Township

BENNETT MINING COMPANY LIMITED [*circa* 1927] (33)

In Maisonville Township, concession II, lots 9 and 10, on former claim L3688, a two-compartment shaft was sunk to a depth of 530 feet and levels were cut at 125-foot intervals. Crosscutting and drifting were reported early in 1927, but in June the plant was dismantled (Kindle 1936, p.11).

About 800 feet (two holes, 133.5 and 174 feet) and 1,200 feet (one hole, 130 feet) southwest of the main shaft, diamond drilling was done in 1958 by Mr. S.A. Pain. The holes intersected diorite and volcanic rocks cut by syenite dikes and quartz veins (ODMNA files, Kirkland Lake).

C. COLE [*circa* 1951] (34)

In Maisonville Township, near the boundary between concession III, lot 7, north half, northeast quarter and concession IV, lot 7, south half, southeast quarter, four pits were sunk by Crown Reserve Mining Company Limited in 1914. The pits are in fractured silicified mafic volcanic rocks cut by a feldspar porphyry dike. The volcanic rocks contain disseminated pyrite and blebs and irregular stringers of pyrite and pyrrhotite with minor amounts of chalcopyrite. Two samples analyzed by The International Nickel Company of Canada Limited contained 0.03 and 0.04 percent nickel, according to notes by W.S. Savage (in ODMNA files, Kirkland Lake).

ELZINA MINES LIMITED [*circa* 1938] (35)

In Maisonville Township, concession IV, lot 10, south half, narrow quartz-carbonate veins cut hornblende syenite and gabbro. The No. 1 vein, striking N60E and dipping 50 to 70N, ranges from 3 to 14 inches wide along its stripped length of 200 feet. Grab samples taken at intervals along the vein returned assays of $0.80, 1.20, 0.80, 0.40, and 8.80 worth (gold at $35 per ounce) of gold per ton (D.K. Burke 1938). Three holes have been drilled on the property, but no information on them is available.

THE GOLDEN SUMMIT MINING COMPANY LIMITED [1945] (36)

In Maisonville Township, concession I, lot 6, north half (formerly the Jensen farm) a gold-bearing quartz vein was discovered south of Kapakita Creek, in 1913. The vein was 6 inches wide and was traced for 150 feet. In 1919, The Golden Summit Mining Company Limited was incorporated to take over the property, and in 1921, a pit on the discovery vein was deepened to a depth of 27 feet. In 1924 the company was reorganized to Golden Summit Mines Limited. During 1929 and ensuing years a shaft collared 450 feet west of the old pit was deepened to 405 feet and lateral work was done on the 125-, 250-, and 375-foot levels. A small mill installed in 1935 produced during 1936 and 1937. By 1937, when mining ended, some stoping had been done on the 125-foot level. From 737 tons of ore, total production worth $3,738 was recorded with the Ontario Department of Mines for 1936, 1937, and 1945, when mill clean-up was carried out (ODM 1953, p.16).

Most of the gold is in pyrite-containing quartz-carbonate veins cutting basalt, diorite, syenite, and lamprophyre. Assays of $3.20 and less (gold about $20 per ounce) were obtained in the shaft station at the 125-foot level, and of $1.60 and less along the crosscut (Odell 1930). The shaft was sunk in the vicinity of two narrow east-trending quartz veins about 40 feet apart, the south vein being the discovery vein. Immediately east of the shaft is a strong shear zone trending north, parallel to the strike of the flows. The east wall of the shear is a lamprophyre dike about 50 feet wide. The most important vein encountered underground was exposed in the northwest crosscut on the 125-foot level. It was a high-grade quartz vein striking east and ranging in width from 2 inches to 10 inches. It had been intersected and displaced by a flat fault dipping west. The wall-rocks adjacent to the vein were highly fractured and veined with red feldspathic material; they contained gold.

HASTINGS-MOFFAT [*circa* 1934] (37)

In Maisonville Township, concession II, lot 8, south half, southwest quarter, five holes were drilled in 1934 by Erie Canadian Mines Limited, the exploration subsidiary of Sylvanite Gold Mines Limited. This drilling totalled 464 feet of quartz veins striking and dipping in several directions, in an area having a diameter of about 400 feet. The host rock is syenite and altered mafic rocks. A few short intersections (average 2 feet) contained gold worth about 40 cents per ton. The best assay of several samples from pits in lot 8 and 9 is $3.60 in gold per ton (gold at $35 per ounce) (ODMNA files, Kirkland Lake).

Bourkes Area

THE INTERNATIONAL NICKEL COMPANY OF CANADA LIMITED (38)

In Maisonville Township, concession V, lot 7, north half, southwest quarter, a hole, 678 feet deep, was drilled in 1965 by The International Nickel Company of Canada Limited. The hole intersected interbedded graphitic tuff, chert, and volcanic rocks. The rocks contain weak mineralization and are cut by quartz veins (ODMNA files, Kirkland Lake).

KERR ADDISON MINES LIMITED (39)

Goose Lake Group

In Maisonville Township, concession IV, lots 4 and 5, near Goose Egg Lake, an airborne electromagnetic anomaly was tested in seven holes, totalling 3,326 feet, drilled by Kerr Addison Mines Limited in 1965, 1966, 1967, and 1969. The drill holes are along a strike length of about 2,000 feet, and all intersected graphitic tuff and cherty slate interbedded with mafic and felsic volcanic rocks that are cut by diorite. The graphitic zones, generally striking northeast and dipping northwest, typically contain nodular pyrite and stringers and blebs of pyrrhotite. Also present are blebs and stringers of chalcopyrite, as well as carbonate stringers containing sphalerite, galena, and chalcopyrite. This type of low grade base metal mineralization (about 1 percent combined zinc, copper, and lead) was intersected in 40- to 60-foot lengths of core. Drilling of this property was resumed by Kerr Addison in February 1969. A 700-foot drill hole intersected rhyolite breccia and graphitic dacite tuff and slate containing seams and bands of pyrite, pyrrhotite, and minor amounts of sphalerite. Porphyritic diorite also is present in drill core (ODMNA files, Kirkland Lake).

KERR ADDISON MINES LIMITED (40)

Kapakita Group

In Maisonville Township, concession II, lot 3, north half, southwest quarter, a 494-foot hole was drilled by Kerr Addison Mines Limited to test an airborne electromagnetic anomaly. The drill intersected several zones of graphitic slate containing nodular pyrite. Three short lengths (1 to 2½ feet) of the graphitic slate yielded analyses averaging 0.2 ounce of silver per ton, 0.02 percent copper, and 0.02 percent zinc (ODMNA files, Kirkland Lake).

LABINE-SMITH [*circa* 1914] (41)

In Maisonville Township, concession II, lot 9, north half, southwest quarter and northwest quarter, and lot 10, north half, northeast quarter, five pits and trenches were carefully sampled (ODMNA files, Kirkland Lake, report signed G.W. Dixon, August 10, 1914). Most assays for gold were less than $1.00 per ton (gold

at $20.67 per ounce) and for silver were less than 1 ounce per ton.

A shaft, with an average dip of 35 degrees, had been sunk to a depth of 80 feet on a narrow quartz vein carrying free gold and tellurides.

JOHN G. LANGS, TRUSTEE (42)

In Maisonville Township, concession V, lot 5, near the eastern shore of Wolf Lake, Dane Mining Company Limited trenched three parallel northwest-striking quartz veins cutting schistose pyrite-containing amygdaloidal basalt (Burrows and Hopkins 1914, p.34). A 50-foot shaft had been sunk on three parallel "quartz-and-schist" gold-bearing veins striking northwest through amygdaloidal basalt. About ½ mile to the southeast, gold-bearing quartz veins and stockworks cutting syenite were stripped for 400 feet. In addition to the syenite or "feldspar porphyry", diabase, and "greenstone" in this outcrop, the map by Burrows and Hopkins (1914) shows lamprophyre containing "pebbles".

In 1917, Murray-Mogridge Mines Limited deepened the shaft to 227 feet and crosscut and drifted on the 50-, 100-, and 200-foot levels.

Later, development work was done by Lakeland Gold Mines Limited. The Murray-Mogridge shaft was deepened to 825 feet, with six levels, and on the showing about ½ mile to the southeast a 200-foot shaft was sunk, with two levels. A mill of 100 tons daily capacity was under construction late in 1933, but the mine closed down in 1934, and the company was succeeded by Lakeland Gold Limited.

In 1936, Noranda Mines Limited took an option. Work consisted of at least seven drill holes and assays of samples from No. 1 shaft's 1st, 3rd, and 4th levels. With the exception of two very narrow sections in hole No. 1, assaying $6.30 and $4.20 (gold at $35 U.S. per ounce), nothing of even near commercial grade was cut (Oille 1937). Assays of samples from No. 1 shaft were considerably lower than indicated on assay plans by Lakeland, and Noranda Mines Limited dropped the option.

MRS. O. M. LEE, ESTATE (43)

In Maisonville Township, concession V, lot 6 (approximately), claim HR580, which was staked by Dan Smith of Sesekinika in 1908 and patented in 1911, a northeast-striking quartz-carbonate vein cutting felsic volcanic rocks was stripped for 200 feet. The vein, which is an average of 1 foot wide, consists of quartz along the walls of a fissure, and at the centre is calcite, with about 30 percent of pyrite, sphalerite, galena, and chalcopyrite. A 40-foot shaft was sunk, and several tons of base metal ore were removed. Some of the vein material remains on the dump.

In claim HR581, 525 feet southwest of the main vein, a similar type of base metal-bearing carbonate vein was discovered cutting Archean cherty slate.

In 1947, the claims were optioned from Bradford Syndicate by Geometal Mines Limited and picket lines were cut, but no follow-up work is known to have been done.

JOHN E. MURRAY (44)

The former "Trapper" claim, BC116 (L1297), in Maisonville Township concession III, lot 12, contains a quartz vein on which a shaft has been sunk. A surface assay plan (*circa* 1912) indicates nil to $5.70 worth of gold per ton (gold at $20.67 per ounce) across about 1½ feet for a strike length of 200 feet. Sampling from 184 to 308 feet along strike to the southwest indicated nil to $2.20 worth of gold across about 1½ feet.

A hole drilled, in 1952 by J.D. Watling, to cut the shaft vein intersected mafic volcanic rocks and reddish porphyry cut by quartz veins. Free gold was seen (Gerrie 1952) in part of the core consisting of quartz, seams of chlorite, and a little coarse-grained pyrite.

SIDNEY A. PAIN (45)

In Maisonville Township, concession II, lot 10, north half, northwest quarter, native gold was discovered in quartz veins and oxidized wall-rock on the former "Malouf" claim (Burrows and Hopkins 1914, p.35). The decomposed material from the quartz veins, which are narrow and dip gently west, was treated in an arrastra at the base of the hill near the railway track.

WARREN PETERSON [*circa* 1953] (46)

In Maisonville Township, concession IV, lot 9, south half, northwest quarter, in the northwest quarter of the claim (formerly numbered L46158), is the main (copper) showing. The showing is on the east side of a north-trending ridge of mafic volcanic rocks and consists of syenite and mafic volcanic rocks cut by quartz stringers containing cubic pyrite and fine-grained chalcopyrite. A dike of "pebble" lamprophyre cut by a feldspar porphyry stringer occurs in the northeast corner of one pit. In 1952, three holes (totalling 1,000.5 feet) drilled near the showings intersected a number of weakly mineralized zones in sheared and massive mafic volcanic rocks cut by syenite dikes (ODMNA files, Kirkland Lake).

A. PUDDEN [*circa* 1955] (47)

In Maisonville Township, concession II, lot 8, north half, northwest quarter and southwest quarter, and in lot 10, south half, southeast quarter, nine holes, totalling 416 feet, were drilled in 1955. The holes were spaced along a north-striking line about ½ mile long. Judging from the azimuth of eight of the nine holes, the veins dip east. The holes intersected quartz veins cutting mafic intrusive rocks containing sparsely disseminated pyrite and chalcopyrite (ODMNA files, Kirkland Lake).

J. G. RUSSELL (48)

In Maisonville Township, concession III, lot 9, south half, southeast quarter, near the No. 1 post of claim L15833, a rusty silificied shear zone has been exposed by pits on the west-facing slope of a hill adjacent to a swamp. The strike of the shear zone, which is in mafic volcanic rocks, is N10W and the dip is about 65W. Irregular quartz stringers and feldspathic material cut the sheared rocks, which contain finely disseminated pyrite and minor molybdenite.

About 500 feet southwest, on the western side of a low outcrop, a quartz vein 4 to 6 inches wide strikes north and dips 20 to 40 west through pillowed volcanic rocks. A narrow streak of darker pyrite-bearing quartz on the footwall is said to have contained gold and tellurides, according to notes by W.S. Savage (in ODMNA files, Kirkland Lake). In the south trench the vein forms a zone having a maximum width of 4 feet.

About 150 feet east of the trench, on the eastern side of a low north-trending ridge of volcanic rocks near the centre of the claim, brecciated andesite is cemented with a fine network of quartz-carbonate-feldspar stringers reported to have contained molybdenite.

On a knoll about 250 feet south of the above showing, quartz-carbonate-feldspar stringers, an average of 1 inch wide, cut brecciated andesite containing pyrite and epidote. The eastern side of the knoll is cut by a syenite dike, and a sample from a trench cut through the knoll from east to west is said to have contained $5.00 worth of gold per ton (gold at $35 per ounce) across 22 feet, according to Savage.

SESEKINIKA TOWNSITE [*circa* 1934] (49)

According to notes by Sylvanite Gold Mines Limited (in ODMNA files, Kirkland Lake), during 1914 some free gold was found by James L. Hughes on claim L4034 in Maisonville Township. The gold was in a narrow quartz vein dipping 15NW. About 1916, Hughes sold the property to Walter Young (of Toronto) and New York interests.

The part of the "Hastings-Moffat" claim L4035 that is in Maisonville Township, concession II, lot 8, south half, southwest quarter, was drilled during 1934 by Erie Canadian Mines Limited, the exploration subsidiary of Sylvanite. Five holes, totalling 464 feet, were drilled to intersect a quartz vein 2 feet wide that strikes east and dips 60N. A few short intersections (average 2 feet) contained gold worth about 40 cents per ton. The best assay of several samples from pits in lots 8 and 9 is $3.60 in gold per ton (gold at $20.67 per ounce) (Erie Canadian Mines Limited 1934).

VENTURES CLAIMS LIMITED (50)

In Maisonville Township, concession V, lot 6, on the western and southern shores of the south bay of Wolf Lake, nine holes, totalling 1,005.5 feet, were drilled by Hoyle Mining Company Limited during the period from 1948 until 1952. The drill holes were spaced along a 3,000 foot length of rocks, from west to

a short distance south of the south bay of Wolf Lake. Their core logs indicate the following rock types to have been intersected: 'greenstones', syenite porphyry, hornblende syenite with quartz stringers and disseminated pyrite, and grey feldspar porphyry.

WICKSTEAD [*circa* **1948**] **(51)**

In Maisonville Township, concession VI, lot 9, south half, northeast quarter and southeast quarter, trenching was done in 1918 along a wide shear zone. The country rocks are gabbro and mafic volcanic rocks cut by syenite. The shear zone strikes N40W and dips vertically and contains quartz-carbonate lenses a maximum of 2 feet wide. One grab sample yielded an assay of $224.00 in gold per ton (gold at $35 per ounce) (W.S. Savage 1948, unpublished ODM report in Kirkland Lake files). Channel samples from a pit were assayed by Broulan Reef Mines Limited and found to contain: $7.70 in gold per ton, across 4 feet; $23.80 in gold per ton, across 2 feet.

In lot 10, north half, about the centre of the four claims, four x-ray holes were drilled to intersect a narrow northwest-striking shear zone. The shear zone contains quartz stringers with pyrite. One hole was collared in Cobalt conglomerate and drilled through basalt cut by syenite (Savage 1948, unpublished ODM report in Kirkland Lake files).

Terry Township

BIEDERMAN [*circa* **1920**] **(12)**

Claims DG67 and L15740, which formerly belonged to William Biederman, straddle the Dunmore Township boundary south of Fallduck Lakes. A showing of gold and molybdenite was discovered in 1908, and a test pit was sunk to a depth of 20 feet on a quartz vein having a maximum width of 20 feet. The vein strikes N40W through the granite, and dips 65 west to vertical. Part of the footwall is biotite schist, and part is granite. The hanging wall is granite. The vein material consists mainly of white quartz, with small areas of pyrite, hematite, and chalcopyrite. Molybdenite occurs as rosettes and along fractures in the quartz. According to Wright (1922, p.21), gold assays from 90 cents to 14 dollars (gold at $20.67 per ounce) and 2 to 3 ounces in silver per ton were obtained. The assay samples were from No. 3 of four holes drilled on the property by a prospecting company from New York.

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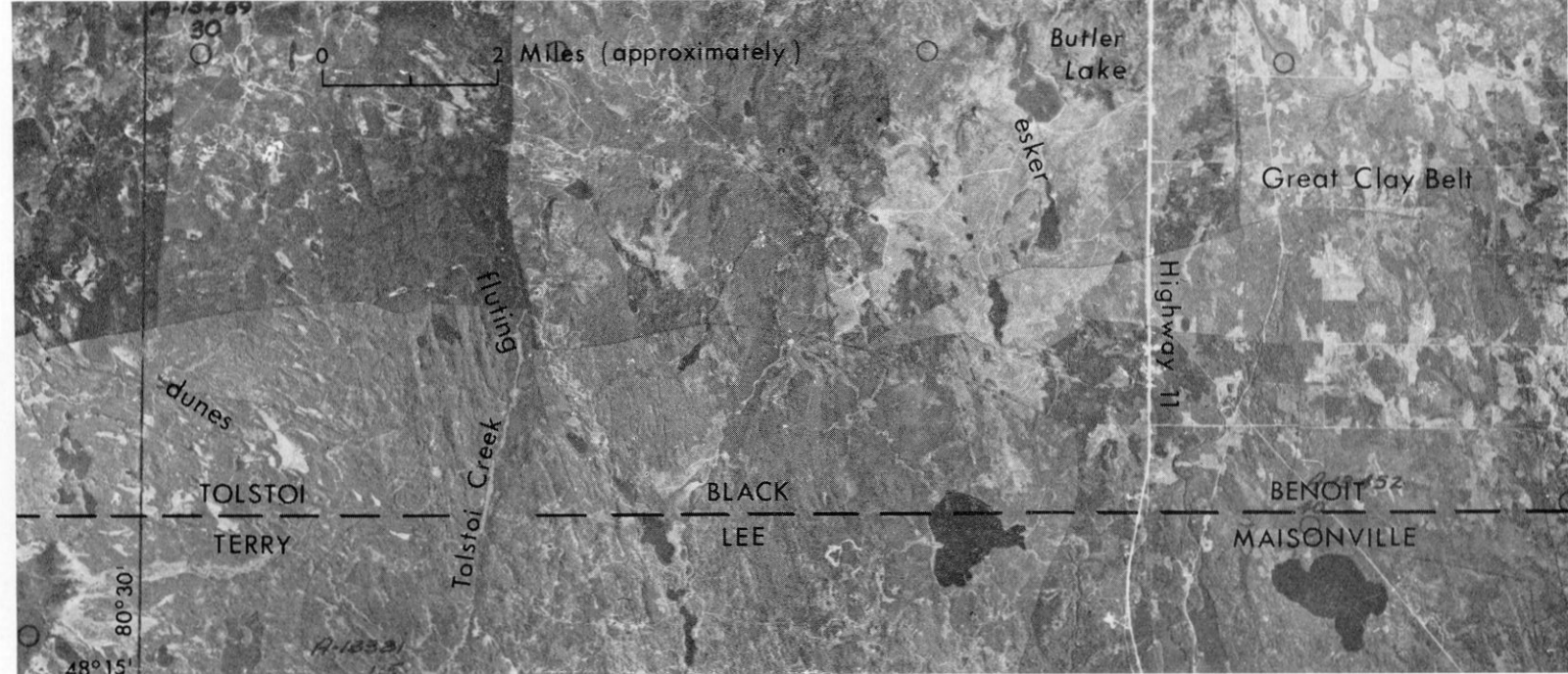
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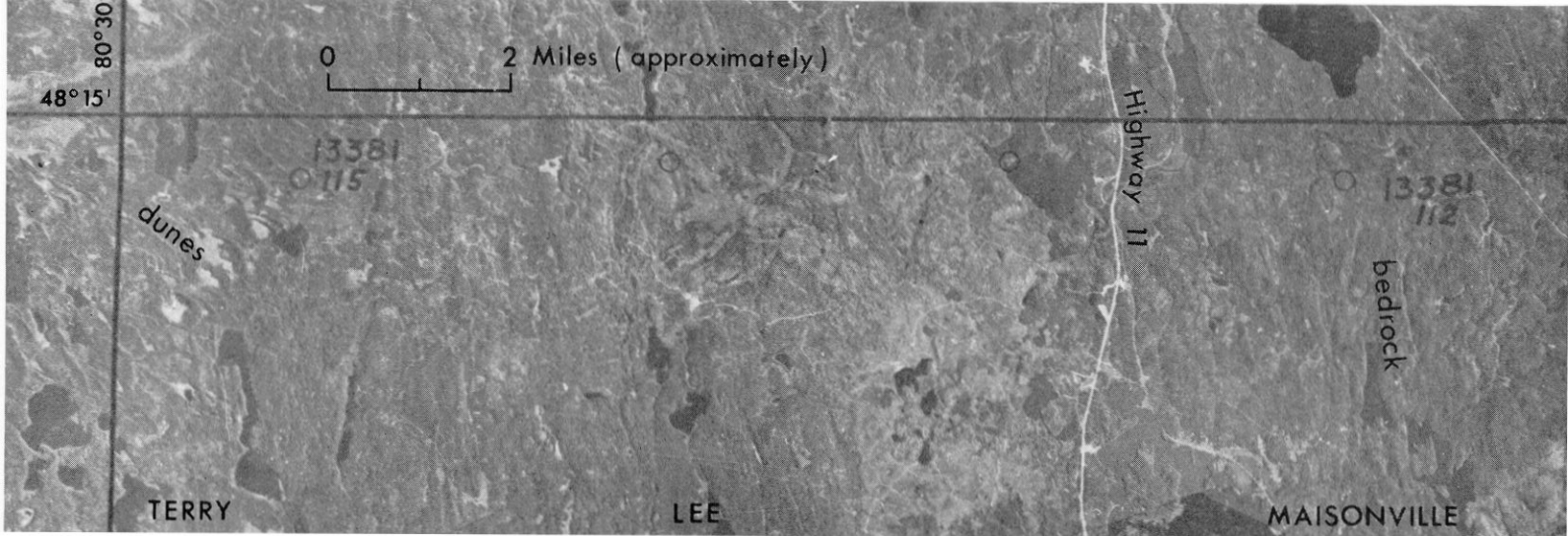
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48°15'
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2 Miles (approximately)
13381
115
dunes
Highway 11
13381
112
bedrock
TERRY
LEE
MAISONVILLE

Map 2213
Tolstoi and Black Townships

ONTARIO
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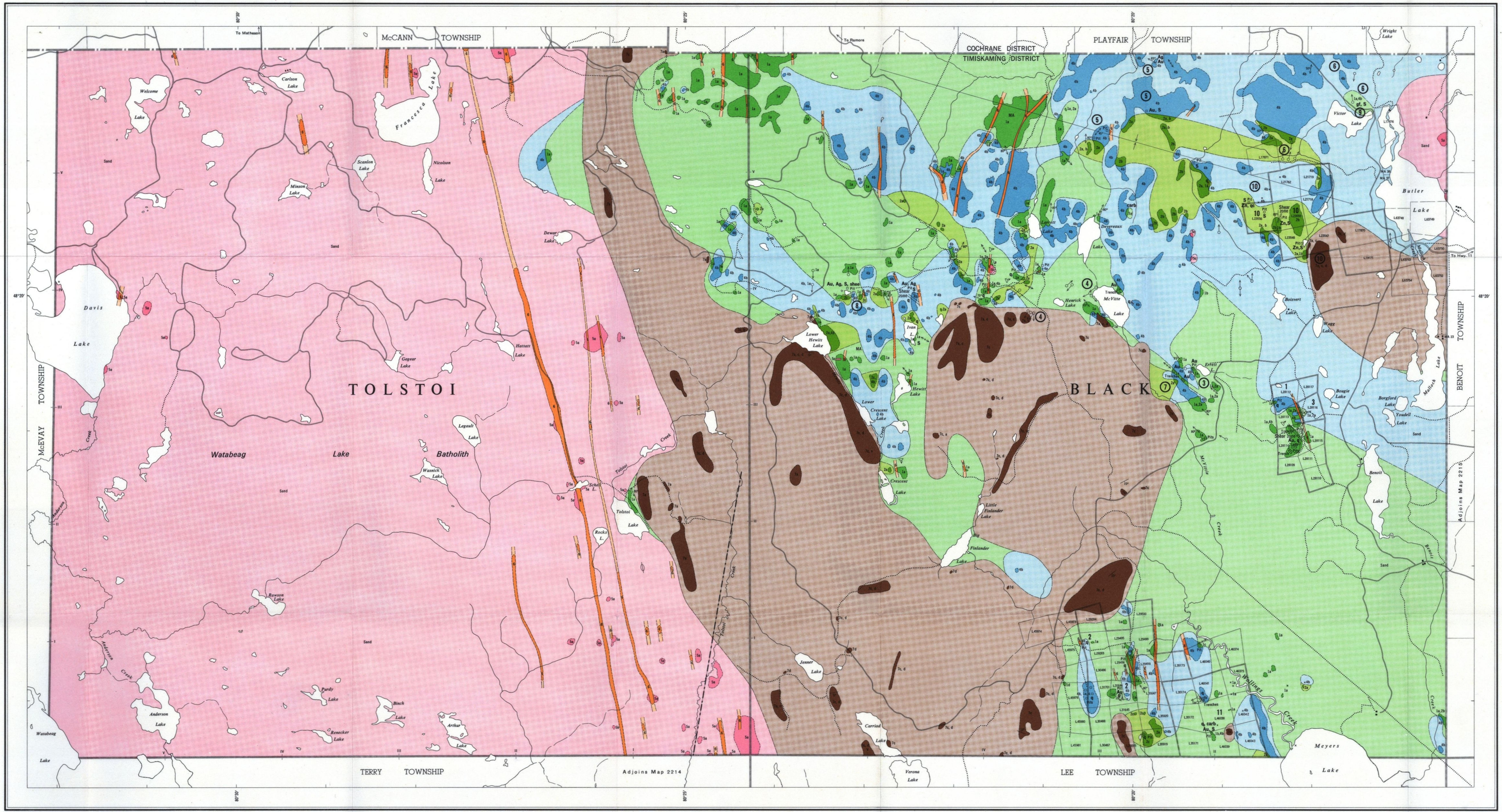
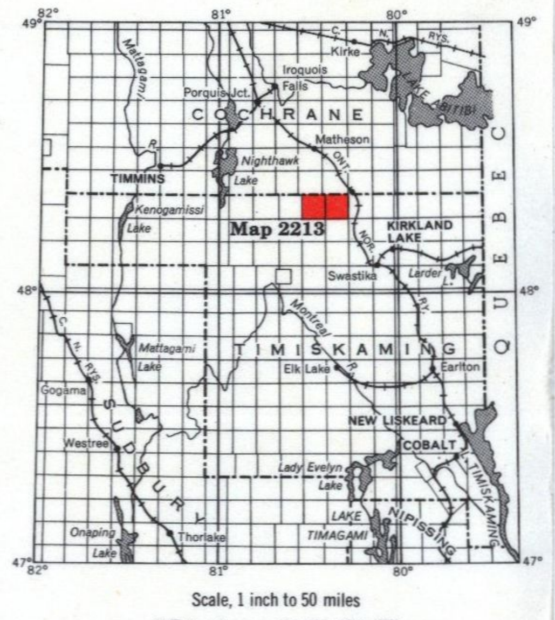
HONOURABLE ALLAN F. LAWRENCE, *Minister*
D. P. Douglass, *Deputy Minister* J. E. Thomson, *Director, Geological Branch*





Scale, 1 inch to 50 miles
N.T.S. reference 42A/7E, 42A/8W

SYMBOLS

- Glacial fluting.
- Small bedrock outcrop.
- Area of bedrock outcrop.
- Bedding, top unknown; (inclined, vertical).
- Lava flow; top (arrow) from pillows shape and packing.
- Schistosity; (horizontal, inclined, vertical).
- Geological boundary, observed.
- Geological boundary, position interpreted.
- Lineament.
- Anticline, syncline, with plunge.
- Drill hole; (vertical, inclined).
- Vein.
- MA Magnetic attraction.
- Motor road.
- Other road.
- Trail, portage, winter road.
- Building.
- District boundary, approximate position only.
- IV Township boundary with mile posts, approximate position only.
- Lot and Concession lines, approximate position only.
- Property boundary, approximate position only.
- Claim line, surveyed, approximate position only.
- 10 Location of mining property, surveyed. (See "List of Properties")
- ⑦ Location of mining property, unsurveyed. (See "List of Properties")

LIST OF PROPERTIES

BLACK TOWNSHIP

1. *Black Creek Gold Mines Ltd. [circa 1946]*
2. *Gipsy Gold Mines Ltd. [circa 1947]*
3. *Gray, J. J. [circa 1947]*
4. *Hagen-McCrea.*
5. *Henderson, S. [circa 1947]*
6. *International Nickel Co. of Canada Ltd., The [circa 1966]*
7. *Legend Gold Mines Ltd. [circa 1946]*
8. *North Expo Mines Ltd.*
9. *Selco Exploration Co. Ltd.*
10. *Solmes, W. P., and O'Connor, F. T. [circa 1964]*
11. *White-Karry Gold Mines Ltd. [circa 1948]*

Date in square brackets refers to year of last major work.

LEGEND

CENOZOIC[a]

RECENT

Swamp and stream deposits.

PLEISTOCENE

Sand, gravel, clay.

UNCONFORMITY

PRECAMBRIAN[b]

PROTEROZOIC

HURONIAN

COBALT GROUP

GOWGANDA FORMATION

7
7a Conglomerate.
7b Arkose.
7c Quartzite and greywacke.
7d Argillite.

UNCONFORMITY

ARCHEAN

MAFIC INTRUSIVE ROCKS (MATACHEWAN)

6
6 Diabase.

INTRUSIVE CONTACT

FELSIC INTRUSIVE ROCKS (ALGOMAN)

5
5a Granite, hornblende-biotite granite, granodiorite.
5b Granite gneiss.
5c Syenite, syenite porphyry, quartz syenite.
5d Mafic syenite, lamprophyre.†

INTRUSIVE CONTACT

MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS (HAILEYBURIAN, EARLY ALGOMAN, AND SOME KEEWATIN)

4
4a Serpentinite, peridotite.
4b Gabbro, diorite, may include some 1a.

INTRUSIVE CONTACT

METASEDIMENTS, TIGHTLY FOLDED (TIMISKAMING OR KEEWATIN)

3
3 Slate, chert, tuff.†

UNCONFORMITY

FELSIC METAVOLCANICS (KEEWATIN)

2
2a Dacite, rhyodacite, minor amounts of rhyolite.
2b Silicic and intermediate tuff and agglomerate.
2c Dacite porphyry, amygdaloidal dacite, spherulitic dacite.

MAFIC TO INTERMEDIATE METAVOLCANICS (KEEWATIN)

1
1a Basalt and andesite (pillowed and massive) may include some 4b.
1b Mafic agglomerate and tuff.
1c Altered (bleached) mafic metavolcanics.
1d Andesite porphyry, amygdaloidal andesite, variolitic andesite.

Ag	*Silver.*
Au	*Gold.*
carb	*Carbonate.*
Cu	*Copper.†*
ep	*Epidote.†*
gf	*Graphite.*
gt	*Garnet.†*
hem	*Hematite.†*
mag	*Magnetite.†*
Mo	*Molybdenum.†*
Ni	*Nickel.†*
Pb	*Lead.†*
q	*Quartz.*
qc	*Quartz-carbonate.*
S	*Sulphide mineralization*
shee	*Scheelite.*
Te	*Tellurium.†*
Zn	*Zinc.*

---

[a] *Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured parts on the map..*

[b] *Bedrock geology. Outcrops and inferred extensions of each rock map unit are shown. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

†Appears on companion sheets Map 2214 or Map 2215.

Published 1971

Map 2213

TOLSTOI AND BLACK TOWNSHIPS

TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles
Metres 1000 0 1 2 3 Kilometres
Feet 1000 0 5,000 10,000 Feet

SOURCES OF INFORMATION

Geology by H. L. Lovell and assistants, 1965 and 1966. Geology is not tied to surveyed lines.

Geological and geophysical maps and reports of mining companies.

Preliminary maps P. 327 Tolstoi Township, P. 328 Black Township, scale 1 inch to ¼ mile, issued 1966.

Cartography by D. V. Impey and assistants, Ontario Department of Mines, 1970.

Basemaps derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests, with revisions by H. L. Lovell.

Magnetic declination in the area was approximately 9°30′ W, 1966.

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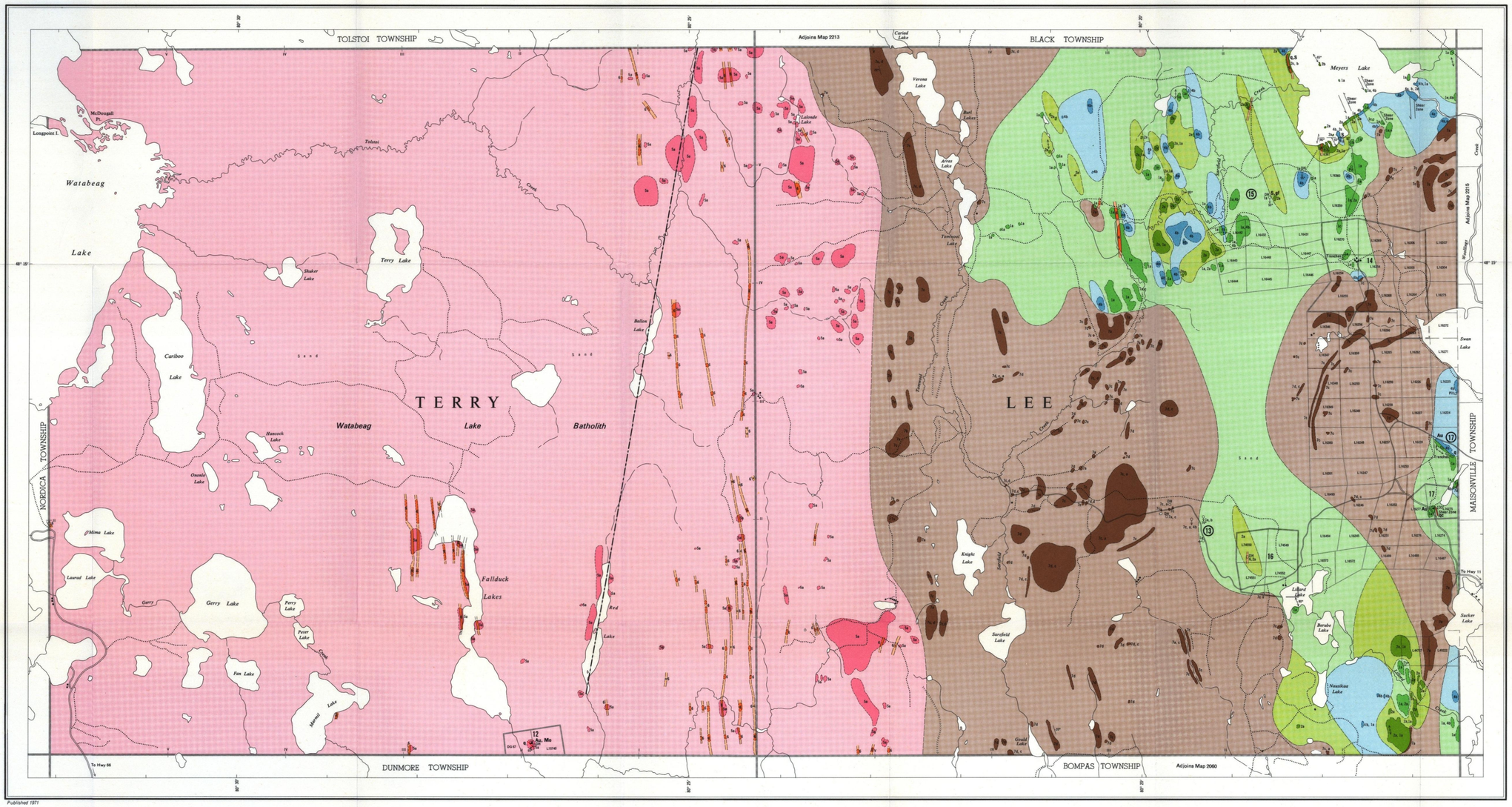

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SYMBOLS

- Esker.
- Small bedrock outcrop.
- Area of bedrock outcrop.
- Bedding, top unknown; (inclined, vertical).
- Lava flow; top (arrow) from pillows shape and packing.
- Schistosity; (horizontal, inclined, vertical).
- Geological boundary, observed.
- Geological boundary, position interpreted.
- Lineament.
- Drill hole; (vertical, inclined).
- Vein.
- Shaft; depth in feet.
- Motor road.
- Other road.
- Trail, portage, winter road.
- Building.
- Township boundary with mile posts, approximate position only.
- Property boundary, approximate position only.
- Claim line, surveyed, approximate position only.
- 12 — Location of mining property, surveyed. (See "List of Properties")
- 15 — Location of mining property, unsurveyed. (See "List of Properties")

LIST OF PROPERTIES

TERRY TOWNSHIP

12. Biederman [circa 1920]

LEE TOWNSHIP

13. Campbell, Mildred
14. Campbell, Norman A.
15. International Nickel Company of Canada Limited, The
16. Jeanjacquet, Frédéric
17. Lee Gold Mines Limited

Date in square brackets refers to year of last major work.

Map 2214
TERRY AND LEE TOWNSHIPS
TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles
Metres 1000 0 1 2 3 Kilometres
Feet 1000 0 5,000 10,000 Feet

SOURCES OF INFORMATION

Geology by H. L. Lovell and assistants, 1965 and 1966. Geology is not tied to surveyed lines.

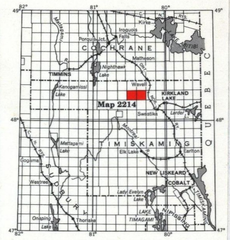
Geological and geophysical maps and reports of mining companies.

Preliminary maps P. 365 Terry Township issued 1966, P. 389 Lee Township issued 1967, scale 1 inch to ¼ mile.

Cartography by D. V. Impey and assistants, Ontario Department of Mines, 1970.

Basemaps derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests, with revisions by H. L. Lovell.

Magnetic declination in the area was approximately 9°30' W, 1966.



Scale 1 inch to 50 miles
N.T.S. reference 42/A1, 42/A2, 42/A7, 42/A8

LEGEND

CENOZOIC[a]

RECENT
Swamp and stream deposits.

PLEISTOCENE
Sand, gravel, clay.

UNCONFORMITY

PRECAMBRIAN[b]

PROTEROZOIC

HURONIAN

COBALT GROUP

GOWGANDA FORMATION
7a Conglomerate.
7b Arkose.
7c Quartzite and greywacke.
7d Argillite.

UNCONFORMITY

ARCHEAN

MAFIC INTRUSIVE ROCKS (MATACHEWAN)

6 Diabase.

INTRUSIVE CONTACT

FELSIC INTRUSIVE ROCKS (ALGOMAN)

5a Granite, hornblende-biotite granite, granodiorite.
5b Granite gneiss.†
5c Syenite, syenite porphyry, quartz syenite.†
5d Mafic syenite, lamprophyre.†

INTRUSIVE CONTACT

MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS (HAILEYBURIAN, EARLY ALGOMAN, AND SOME KEEWATIN)

4a Serpentinite, peridotite.
4b Gabbro, diorite, may include some 1a.

INTRUSIVE CONTACT

METASEDIMENTS, TIGHTLY FOLDED (TIMISKAMING OR KEEWATIN)

3 Slate, chert, tuff.†

UNCONFORMITY

FELSIC METAVOLCANICS (KEEWATIN)

2a Dacite, rhyodacite, minor amounts of rhyolite.
2b Silicic and intermediate tuff and agglomerate.
2c Dacite porphyry, amygdaloidal dacite, spherulitic dacite.

MAFIC TO INTERMEDIATE METAVOLCANICS (KEEWATIN)

1a Basalt and andesite (pillowed and massive) may include some 4b.
1b Mafic agglomerate and tuff.
1c Altered (bleached) mafic metavolcanics.
1d Andesite porphyry, amygdaloidal andesite, variolitic andesite.

Ag	*Silver.†*
Au	*Gold.*
carb	*Carbonate.†*
Cu	*Copper.†*
ep	*Epidote.†*
gf	*Graphite.*
gt	*Garnet.†*
hem	*Hematite.†*
mag	*Magnetite.†*
Mo	*Molybdenum.*
Ni	*Nickel.†*
Pb	*Lead.†*
q	*Quartz.*
qc	*Quartz-carbonate.*
S	*Sulphide mineralization*
shee	*Scheelite.†*
Te	*Tellurium.†*
Zn	*Zinc.†*

[a] *Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured parts on the map.*

[b] *Bedrock geology. Outcrops and inferred extensions of each rock map unit are shown. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

† *Appears on companion sheets Map 2213 or Map 2215.*

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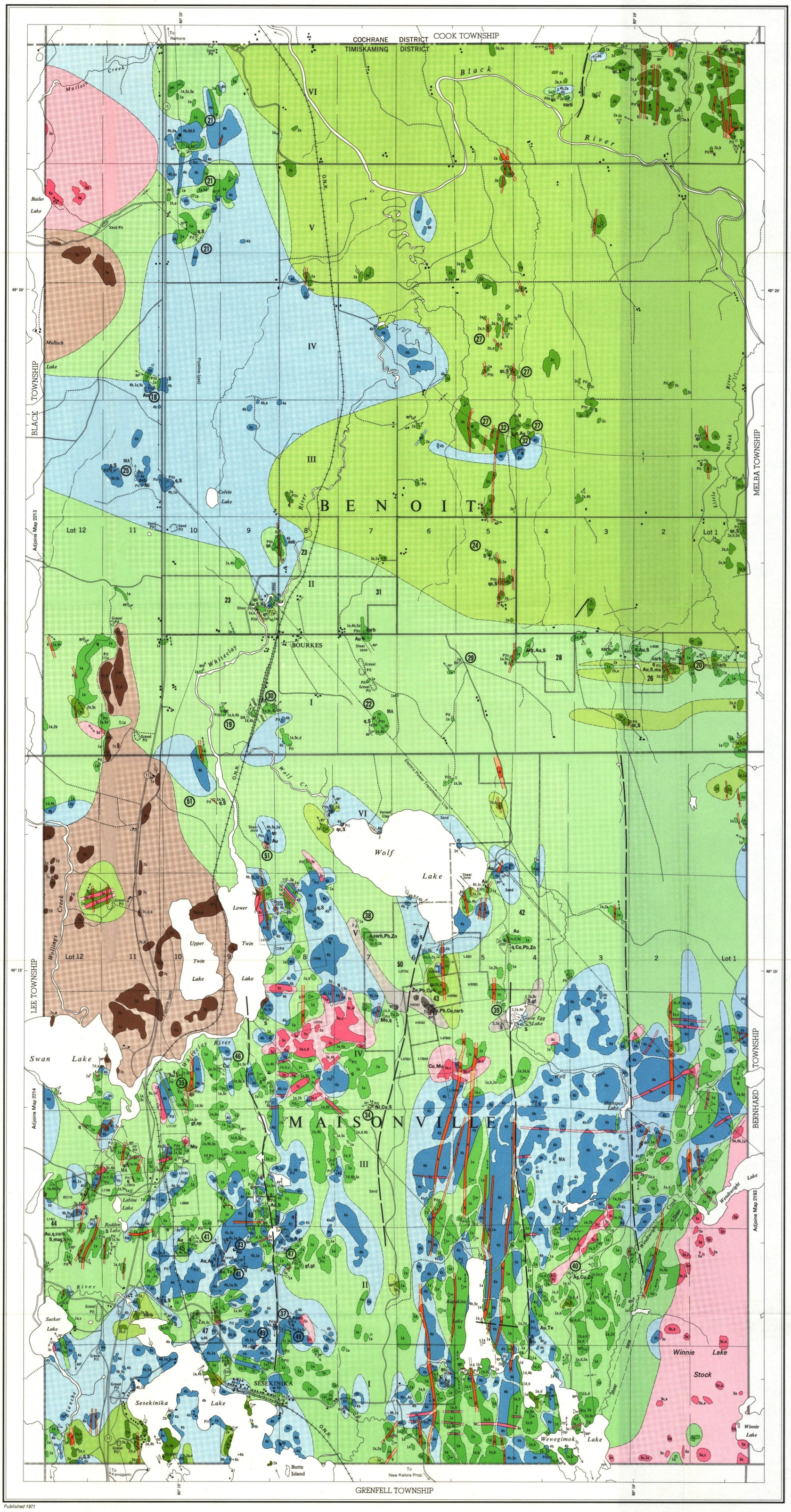
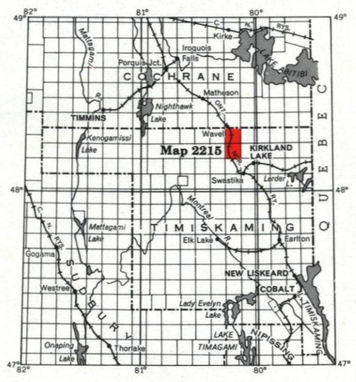
Map 2215
Benoit and Maisonville Townships





Scale, 1 inch to 50 miles

N.T.S. reference 42/A1, 42/A8

SYMBOLS

- Glacial striae.
- Small bedrock outcrop.
- Area of bedrock outcrop.
- Bedding, top unknown; (inclined, vertical).
- Bedding, top indicated by arrow; (inclined, vertical, overturned).
- Lava flow; top (arrow) from pillows shape and packing.
- Schistosity; (horizontal, inclined, vertical).
- Geological boundary, observed.
- Geological boundary, position interpreted.
- Fault; (observed, assumed). Arrows indicate horizontal movement.
- Jointing; (horizontal, inclined, vertical).
- Drag folds with plunge.
- Anticline, syncline, with plunge.
- Drill hole; (vertical, inclined).
- Vein. Width in inches.
- Shaft; depth in feet.
- MA — Magnetic attraction.
- (11) — Motor road. Provincial highway number encircled where applicable.
- Other road.
- Trail, portage, winter road.
- Building.
- District boundary, approximate position only.
- Township boundary, approximate position only.
- Lot and Concession lines, approximate position only.
- Property boundary, approximate position only.
- Claim line, surveyed, approximate position only.
- 50 — Location of mining property, surveyed. (See "List of Properties")
- (22) — Location of mining property, unsurveyed. (See "List of Properties")

LIST OF PROPERTIES

BENOIT TOWNSHIP

18. Bergstrand [circa 1921]
19. Bunting (Johnson) [circa 1920]
20. Carlson, O. [circa 1946]
21. Chamandy, K. [circa 1948], and Mokta Canada Limited [1968]
22. Cotterill [circa 1921]
23. Davidor Mines Ltd.
24. Erickson, K. J.
25. Hagen, Ole
26. Keefe, Daniel G. (W. half of Skjonsby-Klanderland)
27. Noranda Exploration Company
28. Potter, R. S. (Wickstead-Maloof) [circa 1920]
29. Scotvold-Nelson [circa 1921]
30. Skjonsby, K. E.
31. Sword, Axel (part of the former Webb claims, circa 1921)
32. Thompson-McLeod [circa 1921]

MAISONVILLE TOWNSHIP

33. Bennett Mining Co. Ltd. [circa 1929]
34. Cole [circa 1951]
35. Elzina Mines Ltd. [circa 1938]
36. Golden Summit Mining Co. Ltd., The
37. Hastings-Moffat [circa 1934]
38. International Nickel Co. of Canada Ltd., The
39. Kerr Addison Mines Ltd. "Goose Lake group"
40. Kerr Addison Mines Ltd. "Kapakita group"
41. Labine-Smith [circa 1914]
42. Langs, John G., trustee
43. Lee, Mrs. O. M., estate
44. Murray, John E.
45. Pain, Sidney A.
46. Peterson, Warren [circa 1953]
47. Pudden, A. [circa 1955]
48. Russell, J. G.
49. Sesekinika Townsite [circa 1934]
50. Ventures Claims Ltd.
51. Wickstead [circa 1948]

Date in square brackets refers to year of last major work.

LEGEND

CENOZOIC[a]

RECENT
Swamp and stream deposits.

PLEISTOCENE
Sand, gravel, clay.

UNCONFORMITY

PRECAMBRIAN[b]

PROTEROZOIC

HURONIAN

COBALT GROUP

GOWGANDA FORMATION

7 — *7a Conglomerate.*
7b Arkose.
7c Quartzite and greywacke.
7d Argillite.

UNCONFORMITY

ARCHEAN

MAFIC INTRUSIVE ROCKS (MATACHEWAN)

6 — *6 Diabase.*

INTRUSIVE CONTACT

FELSIC INTRUSIVE ROCKS (ALGOMAN)

5 — *5a Granite, hornblende-biotite granite, granodiorite.*
5b Granite gneiss.
5c Syenite, syenite porphyry, quartz syenite.
5d Mafic syenite, lamprophyre.

INTRUSIVE CONTACT

MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS (HAILEYBURIAN, EARLY ALGOMAN, AND SOME KEEWATIN)

4 — *4a Serpentinite, peridotite.*†
4b Gabbro, diorite, may include some 1a.

INTRUSIVE CONTACT

METASEDIMENTS, TIGHTLY FOLDED (TIMISKAMING OR KEEWATIN)

3 — *3 Slate, chert, tuff.*

UNCONFORMITY

FELSIC METAVOLCANICS (KEEWATIN)

2 — *2a Dacite, rhyodacite, minor amounts of rhyolite.*
2b Silicic and intermediate tuff and agglomerate.
2c Dacite porphyry, amygdaloidal dacite, spherulitic dacite.

MAFIC TO INTERMEDIATE METAVOLCANICS (KEEWATIN)

1 — *1a Basalt and andesite (pillowed and massive) may include some 4b.*
1b Mafic agglomerate and tuff.
1c Altered (bleached) mafic metavolcanics.
1d Andesite porphyry, amygdaloidal andesite, variolitic andesite.

Ag	*Silver.*
asb	*Asbestos*
Au	*Gold.*
carb	*Carbonate.*
Cu	*Copper.*
ep	*Epidote.*
gf	*Graphite.*
gt	*Garnet.*
hem	*Hematite.*
mag	*Magnetite.*
Mo	*Molybdenum.*
Ni	*Nickel.*
Pb	*Lead.*
q	*Quartz.*
qc	*Quartz-carbonate.*
S	*Sulphide mineralization*
shee	*Scheelite.*†
Te	*Tellurium.*
Zn	*Zinc.*

[a] *Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured parts on the map.*

[b] *Bedrock geology. Outcrops and inferred extensions of each rock map unit are shown. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

† *Appears on companion sheets Map 2213 or Map 2214.*

SOURCES OF INFORMATION

Geology by H. L. Lovell and assistants, 1965 and 1966. Geology is not tied to surveyed lines.

Geological and geophysical maps and reports of mining companies.

Preliminary maps P. 329 Benoit Township issued 1966 and P. 409 Maisonville Township issued 1967, scale 1 inch to ¼ mile.

Cartography by D. V. Impey and assistants, Ontario Department of Mines, 1970.

Basemaps derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests, with revisions by H. L. Lovell.

Magnetic declination in the area was approximately 9°30' W, 1966.

Published 1971

Map 2215
BENOIT AND MAISONVILLE TOWNSHIPS
TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles
Metres 1000 0 1 2 3 Kilometres
Feet 1000 0 5,000 10,000 Feet